MEDICAL PROCEEDINGS

MEDIESE BYDRAES

A South African Journal for the Advancement of Medical Science

'n Suid-Afrikaanse Tydskrif vir die Bevordering van die Geneeskunde

P.O. Box 1010 · Johannesburg | Posbus 1010 · Johannesburg

Vol. 4 | 29 November 1958 | No. 24

EDITORIAL · REDAKSIONEEL

MEDICAL PRACTITIONERS AND MEDICAL SERVICES

IN AFRICA SOUTH OF THE SAHARA

According to the last issue of the *Annual Epidemiological and Vital Statistics* (1955) published by the World Health Organization, the WHO Region of Africa south of the Sahara totalled 13,215 physicians for a population of about 142 millions, i.e. one physician for 10,745 people.

In Asia, with the exception of continental China, the ratio is of one physician for 4,089 people.

In the Americas, excluding the United States, Canada and Mexico, there is one physician for 1,619 people.

It should also be recalled that Europe numbers 405,608 physicians, not counting 310,186 Soviet physicians, and the United States of America 207,924.

Hospitals and Hospital Accommodation. If comparison between the United States of America and Africa south of the Sahara gives a rather similar figure for the total number of hospitals (6,956 in the USA as against 6,884 in Africa) the total number of beds is 1,604,408 in the USA as against only 300,000 in Africa, i.e. one bed for 500 inhabitants.

IS AFRICA A LESS 'DEADLY' CONTINENT?

This might be believed in consulting the statistics of a few widespread diseases, the figures of which are comforting in comparison with

MEDIESE PRAKTISYNS EN MEDIESE DIENSTE

IN AFRIKA BESUIDE DIE SAHARA

Volgens die jongste uitgawe van die *Annual Epidemiological and Vital Statistics* (1955), gepubliseer deur die Wêreldgesondheidsorganisasie, was daar in die Wêreldgesondheidsorganisasie se streke van Afrika besuide die Sahara altesaam 13,215 geneeshere vir 'n bevolking van ongeveer 142 miljoen, d.w.s. een dokter vir 10,745 mense.

In Asië, met uitsondering van vastelandse China, is die verhouding een geneesheer vir 4,089 siele.

In die Amerikas, uitsluitende die Verenigde State, Kanada en Meksiko, is daar een geneesheer vir 1,619 mense.

Daar moet ook in gedagte gehou word dat daar 405,608 geneeshere in Europa is (by wie die 310,186 Sowjet-geneeshere nie ingesluit is nie), en dat die Verenigde State van Amerika 207,924 dokters het.

Hospitale en Hospitaalakkommodasie. Indien 'n vergelyking tussen die Verenigde State van Amerika en Afrika besuide die Sahara aantoon dat daar min of meer ewe veel hospitale in hierdie twee wêrelddele is (6,956 in die Verenigde State teenoor 6,884 in Afrika), dan moet daar nie uit die oog verloor word nie dat die hospitale in die Verenigde State oor 1,604,408 beddens beskik, terwyl daar in Afrika net 300,000 beddens is, d.w.s. een bed vir 500 inwoners.

those, less optimistic, concerned with the shortage of health personnel. Figures quoted below generally refer to 1955. The figures indicate the number of deaths officially recorded.

	Africa South of the Sahara	*Asia*
Plague	47	486
Smallpox	1,732	33,310
		Latin America
Yellow Fever ...	6	62
		United States
Poliomyelitis ...	239	1,043
		India
Malaria	5,344	126,799
		Europe
Influenza	381	20,967

The Efforts of the Governments in the Field of Vaccination. In the course of 1955, in general (with some exceptions for 1954), the following figures were recorded:

24,024,383 vaccinations against *smallpox,*

10,531,041 of which in the territories under French administration;

6,456,620 vaccinations against *yellow fever,*

6,315,632 of which in the territories under French administration; and

187,534 BCG vaccinations against *tuberculosis.* This was before the launching of mass campaigns against tuberculosis in Africa.

Statistics are not easy to interpret. In an explanatory introduction the writers guard against any misinterpretation of these statistics. In fact, the statistical comparability of the data, although improving from year to year, still leaves much to be desired. Civil registration, for example, represents only a fraction of the world population (42% of the births and only 33% of the deaths). In some countries registration is limited to big towns or urban areas. In others, registration is incomplete, particularly in rural areas where registrars' offices are few and far between and difficult of access.

The overall vital statistics by country are, unfortunately, too often a mixture of complete and incomplete data, so that the overall rates arrived at are obviously unreliable.

However, progress achieved in the registration of epidemiological and vital statistics is best reflected in the fact that the statistics of causes of deaths, according to the abridged list established by WHO, were collected from 51 countries in 1955 as against 42 in 1954 and 35 in 1953.

Is Afrika 'n minder ‚dodelike' Vasteland? 'n Mens sou amper geneig wees om dit te glo as jy die statistieke in verband met 'n aantal wydverspreide siektes ondersoek. Hierdie statistieke is gerusstellend in vergelyking met die minder optimistiese syfers in verband met die tekort aan gesondheidspersoneel. Onderstaande syfers het oor die algemeen betrekking op die jaar 1955, en dui die aantal sterfgevalle aan wat amptelik aangeteken is.

	Afrika besuide die Sahara	*Asië*
Pes	47	486
Pokkies	1,732	33,310
		Latyns-Amerika
Geelkoors	6	62
		Verenigde State
Poliomiëlitis ...	239	1,043
		Indië
Malaria	5,344	126,799
		Europa
Influensa	381	20,967

Regeringspogings op die Gebied van Inenting. In die loop van die jaar 1955 is die volgende syfers (met enkele uitsonderings vir 1954) oor die algemeen aangeteken:

24,024,383 inentings teen *pokkies,*

10,531,041 waarvan in die gebiede onder Franse administrasie was;

6,456,620 inentings teen *geelkoors,*

6,315,632 waarvan in die gebiede onder Franse administrasie was; en

187,534 BCG-inentings teen *tuberkulose.* Dit was voordat die grootskeepse veldtogte teen tuberkulose in Afrika van stapel gestuur is.

Statistieke is nie Maklik on te Vertolk nie. In 'n verduidelikende inleiding waarsku die skrywers teen 'n verkeerde vertolking van hierdie statistieke. Die statistiese vergelykbaarheid van die gegewens verbeter weliswaar van jaar tot jaar, maar laat nogtans veel te wense oor. Burgerlike registrasie, byvoorbeeld, verteenwoordig slegs 'n baie klein persentasie van die wêreldbevolking (42% van die geboortes en slegs 33% van die sterfgevalle). In sommige lande bly registrasie tot die groot dorpe of stedelike gebiede beperk. In ander is die registrasie onvolledig, veral op die platteland waar die registrateurskantore dun gesaai en moeilik is om te bereik.

Die globale bevolkingstatistiek van sekere lande is ongelukkig veels te dikwels 'n mengelmoes van volledige en onvolledige gegewens, met die gevolg dat die finale syfers nie met die werklikheid ooreenstem nie.

Hoe dit ook al sy, word daar vordering met die registrasie van epidemiologiese en bevolkingstatistieke gemaak. Dit blyk duidelik uit die feit dat die statistieke in verband met die oorsake van sterfgevalle, volgens die verkorte lys wat deur die Wêreldgesondheidsorganisasie opgestel is, in 1955 in 51 lande ingesamel is, in vergelyking met 42 lande in 1954 en 35 in 1953.

EXTRA-CORPOREAL CIRCULATION IN OPEN HEART SURGERY

OXYGENATION, CIRCULATION AND BLOOD VOLUME CONTROL

USING THE GROSS TYPE OF HEART-LUNG MACHINE

A PRELIMINARY COMMUNICATION

LOUIS A. DU PLESSIS, M.B., CH.B., DIP. SURG.*

and

WALTER F. SCOTT, M.D. (RAND), M.R.C.P.†

Johannesburg

Although we cannot discuss the whole subject of extra-corporeal circulation, we would like to give a brief survey of our own experiences in 6 cases done with the Gross type of heart-lung machine.

We will confine ourselves to those aspects for which we, as members of the team, have been personally responsible.‡ This machine is the same as the one used by Gross in Boston, except for a few of our own minor modifications (Fig. 1).

THE OXYGENATION OF BLOOD

The oxygenator is of the revolving disc type, as originally designed by Björk and modified by Kay and Cross (Fig. 2).

The principle of the oxygenation depends on a number of discs revolving in a pool of blood. The discs are siliconized and covered with a very thin layer of high vacuum grease. Each disc thus picks up a fine film of blood with each revolution and exposes the blood to a high concentration of oxygen, which flows into the oxygenator.

The oxygenation is related to the following factors:

1. The number of discs used.
2. The spaces between discs.
3. The surface area of the discs.
4. The depth of the discs in the blood.
5. The speed of rotation of discs.
6. The amount of oxygen supplied.
7. The blood flow through the oxygenator.
8. The temperature of the blood in the oxygenator.

We will discuss each of these factors in more detail.

1. *The Number of Discs Used.* The number of discs required is assessed so as to prevent over- or under-oxygenation and to permit the choice of the correct size Pyrex cylinder for making up the oxygenator. This latter information is important as it is desirable to use the minimum priming volume of blood. For instance, if a big size of oxygenator is used for a small baby, a priming volume of 5 pints is necessary. A small alteration of the blood level in this oxygenator, e.g. a drop of ¼ inch, means a drop of about 150 c.c. of blood. This can be disastrous in an infant. When a smaller size of oxygenator with a smaller priming volume is used, a similar change in level of ¼ inch will represent a smaller volume of blood; thus there will be a smaller margin of error. In addition, the smaller priming volume will lessen the demands on blood donors, will diminish the work load of cross-matching and reduce the dangers of transfusion reactions.

Gross states that each disc takes up 1.2 c.c. of oxygen per minute at 100 r.p.m. or 1.5 c.c. at 120 r.p.m. Thus, if basal oxygen requirements per sq. m. and surface area of the patient are known, the approximate number of discs to be used can be calculated as follows:

If basal oxygen requirements = 100 c.c. per minute per sq. m., and the surface area is 1.2 sq. m., the oxygen requirement will equal $100 \times 1.2 = 120$ c.c. per minute.

Each disc takes up 1.2 c.c. of oxygen at 100 r.p.m.; therefore number of discs would be $\frac{120}{1.2} = 100$ discs.

The following additional factors, however, have to be taken in account, viz. the flow of blood through the oxygenator and the arteriovenous difference.

---

* Thoracic Surgeon.

† Physician Specialist.

‡ The surgical aspects were the concern of Mr. D. Adler and Mr. D. Fuller: the haematology, of Dr. Greig; the anaesthesia, of Drs. Meaker and Frost; and the monitoring of the pressures, pre-operative investigations and post-operative treatment, of Drs. Zion and Braudo.

We calculate the flow necessary on the basis of 2.3 litres per sq. m. per minute as recommended by Kirklin. Thus a patient of 1.2 sq. m. will need a flow of 1.2×2.3 which is 2.76 litres per minute. Under normal circumstances 2.76 litres of blood per minute will need 120 c.c. of oxygen for its oxygenation from 70% oxygen saturation (which is normal venous saturation) to the normal 98% oxygen saturation of arterial blood. Hence it can be seen that the arterio-venous difference will have a very big effect on this; e.g. 120 c.c.

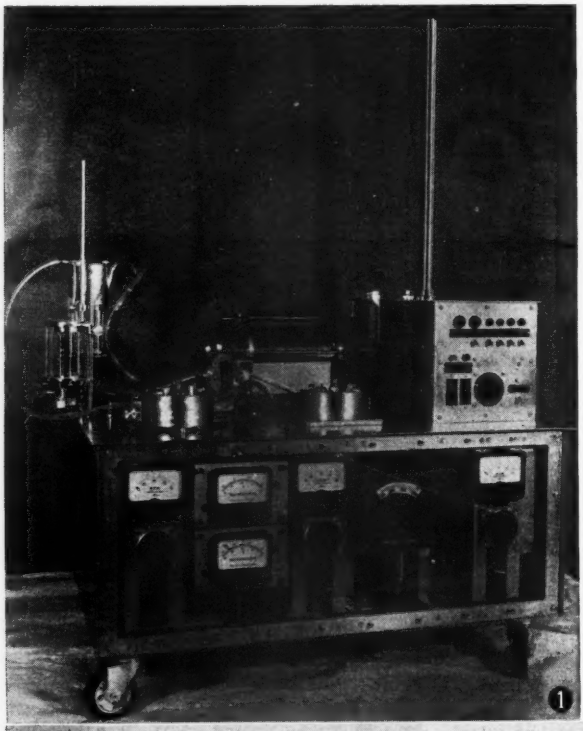
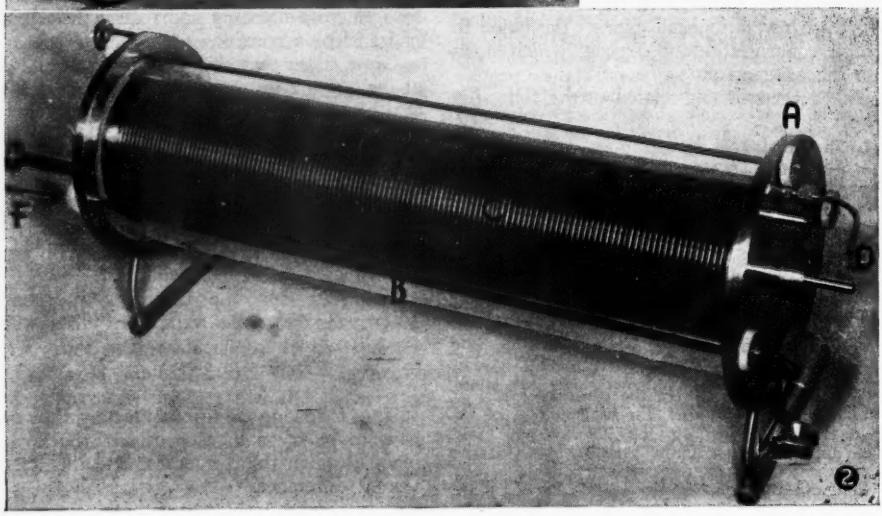


Fig. 1. Kay and Cross oxygenator with de Bakey pumps as used by Gross. We use the same machine.

Fig. 2.
A: End plate.
B: Pyrex glass cylinder.
C: Stainless steel discs.
D: Oxygen inlet rod.
E: Outflow for oxygenated blood.
F: Venous blood entry into oxygenator.



of oxygen will not oxygenate 2.76 litres of blood to 98% oxygen saturation, if the venous saturation falls to 40%. This can, however, be corrected in 2 ways:

i. *When going on to by-pass, the venous oxygen saturation must be* 70%. This is not always practicable, because during partial by-pass the venous saturation may drop unless the blood oxygenation is assisted by inflation of the lungs by the anaesthetist. The degree of partial by-pass and the amount of assisted oxygenation by the anaesthetist is, however, very difficult to control in maintaining an accurate venous oxygen saturation of 70%.

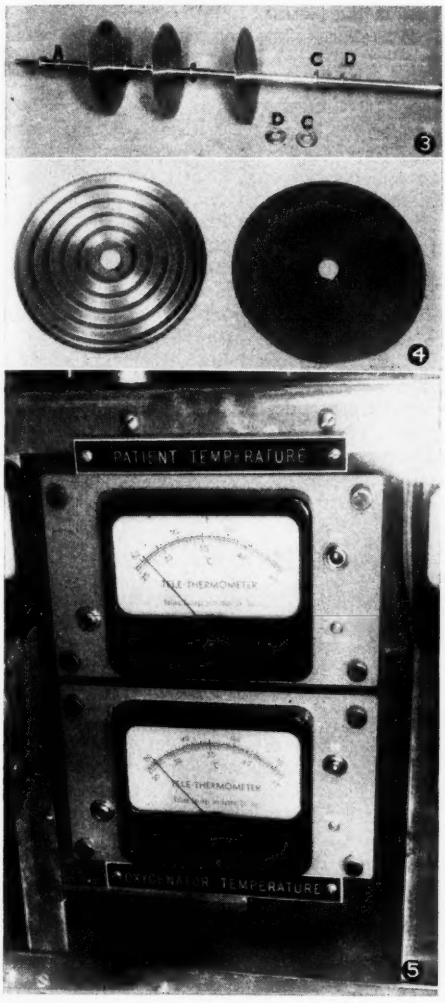


Fig. 3.
A: Shaft carrying discs and spacers.
B: Stainless steel discs.
C: Thick spacer.
D: Thin spacer.

Fig. 4. Convoluted disc as compared with the stainless steel disc.

Fig. 5. Thermometers.

ii. *There should be some reserve oxygenating power.* This can be done by using more than the pre-calculated number of discs. However, the problem of over-oxygenation then immediately arises. We believe that a mixture of 98% oxygen and 2% carbon dioxide at a flow of 15 litres per minute will prevent over-oxygenation. We have used discs in excess of our calculation, and with the afore-mentioned oxygen carbon-dioxide mixture, we have not experienced the problem of over-oxygenation in any of the patients done.

We find that we do not get 1.2 c.c. of oxygen per disc per minute, but only about 0.8 c.c. per disc per minute. The difference in the oxygen uptake per disc per minute, as used by Gross and by us, may be because Gross works at sea level and we operate at over 5,000 feet above sea level; in other words, the difference in oxygen tension may influence the oxygenation of the blood.

2. *Spacers Between the Discs.* Fig. 3 illustrates that with the same size oxygenator the number of discs can be increased by using the narrower spacers. There is, however, a minimal optimal thickness for these spacers because, should they be made any thinner, the blood will tend to 'column' between adjacent discs, thus interfering with the oxygenating surface area.

3. *Surface Area of the Discs.* The discs we use are 0.6 mm. thick and 11.6 cm. in diameter. This is the maximum size which can conveniently fit the machine.

To increase the oxygenating power, larger discs can be used, but this is impracticable as it will increase the priming volume and change the otherwise desirable features of the machine.

A second method of increasing the oxygenating power is to increase the surface area of each disc by means of convolutions. This is done by stamping the discs with concentric 90 degree impressions (Fig. 4). This increases the oxygenating surface by 41.4% over the flat disc.*

We have not used these discs yet, because it is stated that they should be used with the thicker spacers to prevent blood from 'columning.' Thus what is gained by increasing the

* Journal of Thoracic Surgery, August 1958.

surface area of the disc is lost by a decrease in the number of discs.

4. *Depth of Discs in the Blood.* The oxygenator is primed with heparinized blood so as to immerse the discs 4.1 cm. This is a level calculated to provide a maximum exposure area of blood to oxygen. By deeper immersion the exposed surface area will be decreased and by shallower immersion the high velocity portion of the disc will cut across the surface of the blood pool rather than enter it. Also, if the level is too low, the danger of foam formation and the risk of air entering the blood flowing out of the oxygenator, will arise.

5. *Speed of Rotation of Discs.* With each rotation a very thin film of blood is picked up by the disc and exposed to a high concentration of oxygen. The carbon dioxide, because of its easy diffusibility to a lower carbon dioxide tension, is thus lost and oxygen is taken up by the haemoglobin.

It is obvious that the surface area of the blood exposed to the oxygen will be increased proportionately to the number of revolutions of the discs. Speeds in excess of 120 r.p.m., using the thin-size spacers, and 140 r.p.m., using the 4.1 mm. spacer, will cause 'columning,' excessive foaming and haemolysis of the blood. With the use of the 4.1 mm. spacer, speeds up to 140 r.p.m. can be used. This manoeuvre alone with the 20 inch oxygenator containing 94 discs, will increase the oxygenating surface from 140 to 172.2 sq. m.*

6. *Amount of Oxygen Supplied.* As previously stated, we used a 98% oxygen and 2% carbon dioxide mixture. This is delivered into the oxygenator at a rate of 15 litres per minute. With this flow, more than adequate oxygen is supplied to the discs for oxygenating the normal flow rates of the blood.

Fig. 2 shows that the oxygenator has big vents on the end plates to allow free escape of gas, thus maintaining an atmospheric pressure within the oxygenator.

7. *Blood Flow Through the Oxygenator.* The blood flow through the oxygenator can influence the oxygenation if an inadequate number of discs is used. As each disc can only supply a constant amount of oxygen per minute, increasing the volume of blood flowing through the oxygenator to above the precalculated flow, will result in inadequate oxygenation. Should the blood flow through the oxygenator be too rapid, as may happen if the clearance between the bottom of the discs and the glass cylinder is too big, blood will tend to channel at the bottom, resulting in some blood not being picked up by the revolving discs. The oxygenator is, however, designed to obviate this and we have not found this trouble in any of the cases done.

8. *Temperature of the Oxygenator Blood.* Under normal conditions 98% of the oxygen is carried in the blood in chemical combination with Hb, and 2% is actually in physical solution in the plasma.

Blood at a low temperature will contain more oxygen in *solution* than will warm blood.

Thus if the temperature of the oxygenator blood is raised above body temperature, a little less oxygen will be carried in solution. This is unimportant as far as oxygenation is concerned, but what is much more important is that, should the temperature of the blood in the oxygenator be far below normal body temperature, it will (on entering the patient) be raised to body temperature and thus some of the oxygen kept in *solution* will be liberated as a free gas. This may lead to air embolism with subsequent disastrous results.

Fig. 5 shows that with this type of machine it is easy to monitor and control the oxygenator blood temperature. We have found that with a little experience the temperature of the oxygenator blood and the patient's temperature can be synchronized. We have no reason to believe that in any of the 6 cases done, air emboli occurred.

THE CIRCULATION OF BLOOD

For adequate circulation of blood using the extra-corporeal circulation, it is necessary to have:

Adequate venous return;
Unobstructed flow through oxygenator and tubing;
Adequate return of the oxygenator blood to the patient.

Venous Return. In all 6 cases there was no difficulty in obtaining the pre-calculated venous return, except that in 1 case the flow from the inferior vena cava was inadequate. It was later realized that the catheter had been inserted too deeply into the inferior vena cava and had probably entered the portal vein. This was corrected by withdrawing the catheter slightly.

In this machine the venous return depends simply on gravity. This allows the blood to drain directly into the oxygenator without any intervening pumping mechanism. We have found that with the venous collecting chamber about 4–8 inches below the level of the right auricle, maximum drainage is obtained. A gradient of less than 4 inches caused a marked decrease in venous return and a gradient of more than 8 inches caused the venous return to fluctuate, because the thin-walled veins collapse on the catheter openings.

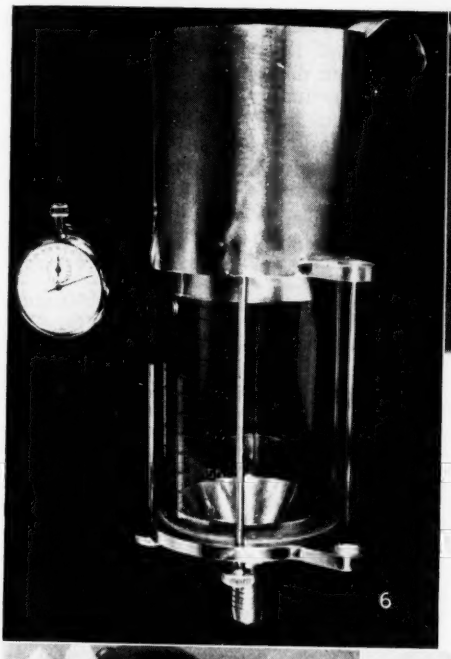
* Journal Thoracic Surgery, August 1958.

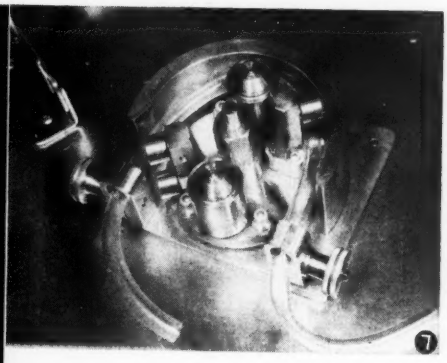
To measure the venous return accurately, we devised a simple flow meter (Fig. 6).

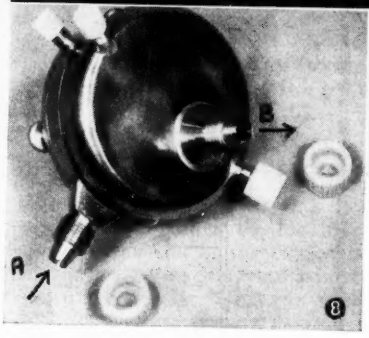
At the time of going on to by-pass, an estimation of the flow is made and checked at short intervals. By adjusting the height of the venous collecting chamber, we obtained the pre-calculated flow. In addition, as will be discussed under blood volume control, we found that by over-transfusing the patient with about 200 c.c. just before going on to by-pass, the venous return has been adequate.

Return of Oxygenated Blood to Patient. Our machine incorporates the de Bakey type of pump (Fig. 7).

This type of pump was selected by Mr. D. Adler and Mr. D. Fuller after extensive in-







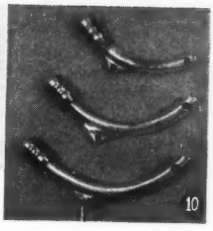


Fig. 6. Flow meter. The glass cylinder is graduated in 50 c.c. A stop watch is also attached. By clamping the venous outflow, the flow rate per unit time can be measured.

Fig. 7. A de Bakey pump.

Fig. 8. Back view of filter to show receiving taper with shouldered nut.
A: Inlet.
B: Outlet.

Fig. 9. Nylon connector (same principle as in Fig. 8). It reduces from $\frac{3}{8}$ inch to $\frac{1}{4}$ inch.

Fig. 10. Arterial cannulae of various sizes showing standard $\frac{1}{4}$ inch stainless steel cuffs and perforated shoulder for secure ligation.

vestigations of the various pump mechanisms.

In none of the cases operated upon has there been any difficulty in returning the oxygenated blood, and there has been no excessive haemolysis.

Other important features in the circulation are:

i. The length of Tygon tubing used.
ii. Connectors on the arterial line.
iii. The arterial cannulae.

About 12 feet of tubing is used in the machine and, should the coronary suction circulation be incorporated, another 10 feet is necessary. We feel that the less tubing is used, the better, not only because it reduces the cost per case, but because the shorter artificial vessels are also obviously better.

The connexions on the high pressure side of the arterial circulation should be as few as possible and absolutely reliable. With our system we use only 4 connexions: — 2 on the filter, 1 between the end of the Tygon tubing and the catheter which is incorporated between the arterial cannulae and the Tygon tubing, and 1 between the arterial catheter and the arterial cannula. All the connectors are of the screw-in type, i.e. the tubing is clamped between a taper and an adjustable nut with a shoulder which tightens the tubing on to the taper.

It will be seen (Figs. 8 and 9) that the nylon connector is of the reducing type, viz. from $\frac{3}{8}$ to $\frac{1}{4}$ inch, thus enabling us to reduce from the standard $\frac{3}{4}$ inch Tygon tubing to the $\frac{1}{4}$ inch standard arterial catheter, which carries the arterial cannula.

For arterial cannulation we have used mostly the left subclavian artery. The cannulae were made from metal tracheotomy tubes to which was silver-soldered a standard size $\frac{1}{4}$ inch stainless steel cuff (Fig. 10).

We made this type of cannula because the tracheotomy tubes consist of inert silver-containing metal, have diameters of various sizes, their lumens can easily be highly polished, they have the right curve for easy insertion into the left subclavian artery and, most important, because of the thin walls, there is very little loss of lumen as compared to the Bardic type of arterial catheter.

CONTROL OF BLOOD AND WATER VOLUMES

The aims of blood volume control in the extracorporeal circulation are threefold:

1. To prevent depletion of the patient's circulating blood volume from haemorrhage or accumulation into the oxygenator during by-pass;
2. To prevent overtransfusion; and
3. To avoid volume fluctuations.

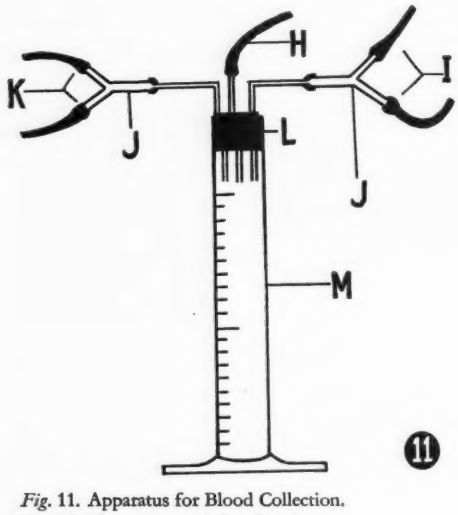


Fig. 11. Apparatus for Blood Collection.
H: Tube from surgeon's hand sucker.
I: Two intercostal catheters.
J: Tubes to suction machines.
K: Rubber bung.
L: Two-litre measuring cylinder.

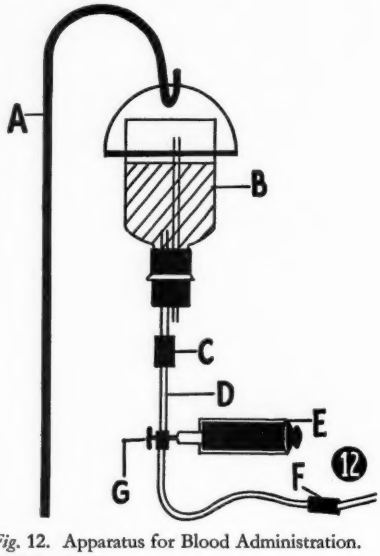


Fig. 12. Apparatus for Blood Administration.
A: Drip stand.
B: Blood bottle.
C: Filter.
D: Tube.
E: 1,000 ml. syringe.
F: Catheter into patient's vein.
G: Three-way tap.

EQUIPMENT

A quick, accurate method of estimating blood loss is essential, particularly when operating on small children. We have used as a drainage sump, a 2-litre glass measuring cylinder graduated in 20 ml. (Fig. 11), with a tightly fitting rubber bung through which pass 3 metal tubes. To one of the tubes are fitted, by means of a Y-connector, the 2 intercostal catheters. To the second tube is attached the hand sucker used by the surgeons. To the third, by means of a Y-connector, are attached 2 suction machines. The reasons for using 2 machines are:

1. To have strong suction;
2. To ensure suction should one machine break down.

The inside of the measuring cylinder is wiped with anti-foam, which prevents the frothing that makes the blood level difficult to read.

Swabs should be weighed regularly whenever possible. Used swabs are weighed regularly throughout the operation in grammes on a balance type of scale by counterbalancing with appropriate unused swabs. One gramme of blood is equivalent to about 1 ml. Patients should be weighed immediately before operation, on return to the ward and daily post-operatively.

Rapid blood replacement can be achieved by having citrated blood in a graduated reservoir or a standard bottle on a drip stand (Fig. 12). Into the tube leading from the reservoir or bottle into one of the arm veins, is incorporated a 3-way tap to which a 100 ml. syringe is attached with a Luer-Lock fitting. To maintain blood balance, the weight of blood on the swabs is added to the volume of blood in the drainage sump, and the appropriate volume of blood, drawn from the reservoir with the 100 c.c. syringe, is introduced into the patient as the loss occurs.

REPLACEMENT

Our aim has been to keep the replacement of blood at 100 ml. ahead of blood loss. This ensures adequate replacement in allowing for unassessed blood lost in pleural cavities, suction tubes and drapes. The positive balance gives a start in replacement when a sudden blood loss occurs. It is also important that the surgeons use the sucker frequently to reduce the time lag between blood loss and replacement. A pump bag on the administering bottle is desirable should the rapid replacement of a large volume of blood suddenly be necessary. An accurate balance can be achieved when the major part of the loss has been replaced. Attachment of the oxygen supply to the bottle inlet is a dangerous procedure.

We use a catheter in an arm vein as it is less likely to cause thrombosis than in a leg vein. The advantage of administration into the leg, however, is that the apparatus and the congestion at the head of the table are reduced.

BLOOD LOSS DURING BY-PASS

During by-pass blood loss can be replaced by running heparinized blood into the oxygenator. The advantage of this is that the oxygenated blood can be replaced rapidly on the arterial side of the patient with more effective maintenance of the blood pressure.[1] The disadvantage is that the added blood alters the volume in the oxygenator, requiring in turn the alteration of the pump speed. The maintenance of a constant volume in the oxygenator and a steady flow by the pump produces a steady state in the patient. Perfusion which most nearly maintains homeostasis reduces the tendency to shock and is followed by the most satisfactory clinical course. The maintenance of a constant volume in the oxygenator during by-pass also facilitates the balancing of blood volume in the oxygenator at the moment of coming off the by-pass.

Before commencing perfusion, a mean blood pressure is ascertained and during perfusion the aim is to maintain this pressure. A deviation of 5 mm. Hg above or below this pressure is considered to be satisfactory. A fall of more than 10 mm. Hg, which cannot readily be corrected, is considered to be severe.

Maintenance of the blood volume is directed at preventing the so-called post-perfusion syndrome characterized by persistent mild hypotension, restlessness, hyperpyrexia and mild cyanosis—all manifestations of poor peripheral circulation. However, in spite of adequate blood volume control, hypotension may develop during anaesthesia, surgery or by-pass.[2] Should hypotension become severe, Wyamine or Methedrine, (15–30 mg. intravenously or intramuscularly) or Levophed (4–12 micrograms per minute) given in a 5% dextrose in water drip, usually helps dramatically. These substances unfortunately only have a temporary effect and in severe shock are unreliable.[3] Persistent hypotension of anything more than mild degree, is always a cause for anxiety, and the post-operative mortality is in the neighbourhood of 50% in this group.[2]

Throughout the by-pass, in order to avoid the post-perfusion syndrome, the team members responsible for observing the blood pressure, the blood level in the oxygenator reservoir and controlling the blood volume, keep one another continuously informed of their observations. Should the blood pressure fall, the flow rate is increased. Should this not produce the required rise in blood pressure from the increased output by the pump, and the blood level in the oxygenator falls, blood is added to the oxygenator reservoir until the blood pressure reaches a satisfactory level.

BLOOD LOSS AFTER BY-PASS

When blood loss has been massive before clotting has become fully restored after by-pass, blood replacement may be considerable. This

has necessitated the rapid replacement of as much as the whole blood volume. Potassium citrate administered in the blood transfusion containing 1.75 g. expressed as Citric Acid in 540 ml. of blood may reach a dangerous blood level in the patient, the exact level of which is difficult to define. A blood level of 50 mg. per 100 ml., giving a normal subject a plasma ionized calcium level of 0.5 mM./Kg. H_2O, may be considered undesirable. In a normal adult this can be achieved by administering 540 ml. of blood in 5 minutes. The plasma citrate level is reduced by the following 3 mechanisms:

Distribution in the extracellular space, metabolic destruction and excretion of 20% in the urine.[4]

In oligaemic shock these mechanisms are probably largely upset and the rapid transfusion of large quantities of citrated blood can produce citrate intoxication. Although we have not done blood citrate levels, the symptoms encountered in one case resembled citrate intoxication. The signs that have been attributed to citrate intoxication in the anaesthetized are:

Arterial hypotension resistant to further blood transfusion or pressor agents, possible prolongation of the clotting time and lengthening of the QT interval leading to asystole.

The toxic effects of citrate can be offset by the administration of calcium gluconate or preferably calcium chloride. We administer this as 10 ml. of 10% calcium chloride in a 100 ml. of 5% dextrose in water in a separate drip.

In one case the blood volume was calculated to be 4,000 ml., the blood lost and replaced was 3,700 ml. The symptoms which developed fitted those of citrate intoxication.

In a second case with massive blood replacement, the administration of Levophed did not materially affect the blood pressure, as tachycardia ensued immediately a small dose of Levophed was administered.

The additional intravenous drip is valuable in maintaining water and electrolyte balance post-operatively, and is particularly useful if sodium bicarbonate for acidosis becomes necessary.

OVERTRANSFUSION

During by-pass, we believe that it is desirable to maintain the patient in a slight volume overload of about 100 ml. over and above the volume assessed to have been lost in the sump, swabs, towels, spillage and in the tubes. The dangers of overload during by-pass are excessive haemorrhage from a high blood pressure when the blood clotting mechanism has been depressed. The body has to adjust to a high volume and this is another disturbing factor in the maintenance of homoeostatis. The danger of overloading before, and particularly after by-pass, is the precipitation of heart failure, especially if a hypoplastic heart chamber, as a result of surgical correction, has to achieve a greater output. The heart should be observed throughout and, if it dilates, the blood volume should be reduced to, perhaps, below the preoperative volume.

We believe that just before going on to by-pass, for as short a time as possible, it is good policy to overload with up to 100 or 200 ml., provided cardiac dilatation does not result. This ensures a good, immediate venous return to the pump, and the by-pass gets away to a good start, avoiding the fall of blood pressure so often experienced at the beginning of the by-pass. Given sufficient venous return, the pump under consideration can always maintain an adequate arterial flow. Therefore, circulatory efficiency depends on a normal blood volume, a normal vascular-bed volume, normal tone in the vascular channels, and adequate venous return to the pump.

UNDERTRANSFUSION

Blood volume depletion during perfusion produces a dangerous train of events, which can be elaborated almost indefinitely. Diminished venous return to the pump, if sustained, will result in diminished arterial supply to the patient, resulting in inadequate filling of the vascular bed. As a result the blood pressure falls. In an effort to maintain blood volume, fluid is drawn from the tissue spaces and the vascular bed volume is reduced by peripheral vaso-constriction. Balance or near balance is therefore maintained and the blood pressure kept up in a condition of masked shock.

This state of enhanced muscular tone cannot be maintained indefinitely. Tissues deprived of their normal nutrition are also unable to get rid of the waste products of their metabolism. Metabolites accumulate in the ischaemic tissues, causing local and generalized diminution in vascular tone. The vascular bed enlarges, increasing its disparity with the blood volume and causes further slowing of the circulation, thus diminishing further the venous return to the pump. A vicious circle has in this way developed. Profound cooling of the blood in the relaxed vascular bed takes place.

At this stage, while still on the pump, excessive amounts of blood transfused will sustain the circulation but, on going off by-pass, the heart is unable to maintain this big flow and a dangerous fall in blood pressure occurs.

WATER BALANCE

It is estimated that the insensible water loss in operations of comparable size is 2.3% of the body weight in 2 hours of operation. This water loss results in a fall in serum water concentration and thus a rise in serum osmolarity. This is the probable cause of the striking thirst from which most of these patients suffer. Thirst is a poor guide to the water requirements and, if water is given to satisfy thirst, water overload can easily be produced. Sturtz *et al.*[5] showed that the serum water concentration usually returned to normal in less than 12 hours, even in patients with a striking negative water balance. Intracellular water becomes available to restore serum water. No attempt was made to increase the amount of intravenous water in the first 24 post-operative hours, as it corrected itself. Possibly the water loss is beneficial to the cardiac patients.

Sturtz, Kirklin, Burke and Power[6] calculated that the average water requirements in the first 24 hours were 500 ml. per sq. metre. From the 25th to the 48th hour, 750 ml. per sq. metre were required. From the 49th to 72nd hour, 750 ml. per sq. metre were required. We have found these quantities to be a good guide. However, it appears that our average requirements may turn out to be a little higher, possibly due to the dryness of our climate.

The only satisfactory method of assessing water balance is to have adequate facilities for weighing the patients frequently.

It is as well to have an indwelling catheter for the first 3 days, to ensure accurate urine collection.

OPSOMMING

Die ondervindings van twee lede van 'n span wat werk met die extra-korporeale sirkulasie word weergegee.

Die faktore wat die oksigenasie in die kunslong beïnvloed asook sekere aspekte van die sirkulasie van bloed deur die masjien, word bespreek.

Aandag word gespits op die belangrikheid van noukeurige bloedvolume bepalings om sodoende oormatige bloedverlies, oor-transfusie of bloedvolume wisselings te voorkom. Die bewaring van die waterewewig word ook bespreek.

We wish to thank Mr. D. Adler and Mr. D. N. Fuller (the surgeons), Dr. M. M. Zion and Dr. J. L. Braudo (the physicians), Dr. K. B. Meaker, Dr. C. Frost and Dr. D. L. Fisher-Jeffes (the anaesthetists) and Dr. H. B. W. Greig and Dr. B. A. Bradlow and their staff of haematologists. All these have participated in the operations.

We wish to thank Mr. L. Fatti, Dr. V. Wilson, Mr. P. E. Marchand, Dr. Hilda Ginsberg and Mr. E. Joubert for their invitation to participate in the experimental work on dogs in the laboratory.

REFERENCES

1. Danziger, A. (1955): Lancet, **2**, 701.
2. Gerbode, F. *et al.* (1958): Lancet, **2**, 284.
3. von Euler, U. S. (1955): Lancet, **2**, 151.
4. Ludbrook, J. and Wynn, V. (1958): Brit. Med. J., **2**, 523.
5. Sturtz, G. S., Kirklin, J. W., Burke, E. W. and Power, M. H. (1957): Circulation, **16**, 1000.
6. Sturtz, G. S., Kirklin, J. W., Burke, E. C. and Power, M. H. (1957): Circulation, **16**, 988.

PROBLEMS OF BLOOD TRANSFUSION*

MAURICE SHAPIRO, M.B., B.CH.

South African Blood Transfusion Service, Johannesburg

The purpose of a transfusion, whether of whole blood or any of its products, is to correct some qualitative or quantitive deficiency in the patient's circulation. Because blood can be stored in a refrigerator, separated into its various cellular and other elements (some of which can be preserved in the frozen or dried state for months and even for years) and administered by injection or infusion like any medicament, one is apt to overlook the fact that a transfusion of blood is in a very real sense the transfer of a living human graft involving social, moral and legal responsibilities which set it apart from all other therapeutic substances and procedures. Everywhere, the voluntary donation of blood, which is the principal and frequently the only source of supply, is regarded as a highly laudable humanitarian gesture which needs to be safeguarded by official organizations. For the foregoing reasons, most countries have made special legislative provision to safeguard not only the safety of the procedures involved but also the social implications of the use of human blood. In South Africa, for example, the Minister of Health has been vested with wide powers under Sec. 83 (*bis*) of the Medical, Dental and Pharmacy Act, to make regulations governing

* A paper read at a meeting of the Southern Rhodesia Medical Association at Bulawayo.

the licensing and inspection of blood donor services and generally to control the withdrawal and use of human blood.

The functions of a comprehensive transfusion service can be enumerated as follows:

To procure and maintain adequate supplies of blood to meet the needs of the sick and injured;

To safeguard the health of the donors;

To prepare and store blood and blood products in a form which is safe for administration to patients;

To ensure that these substances are administered timeously, efficiently and in accordance with the clinical needs of the patients;

To investigate promptly any untoward reaction which may result from the infusion; and

To undertake investigations for the detection of blood group sensitization which may lead to injury by future transfusions or, in the case of expectant mothers, to haemolytic disease of the newborn.

Not all transfusion services assume all these functions. Some, for example, restrict themselves only to the procurement of blood from donors and contract out with independent laboratories for the testing of the donors' bloods. Some include both functions. Very few concern themselves with the actual giving of blood to patients or with ante-natal investigations. An experience of over two decades in the organization and management of a comprehensive transfusion service as outlined here has convinced me that this is the ideal to be aimed at, since maximum safety and efficiency is attainable only when there is complete co-ordination of all the various activities, from the initial recruitment of the donor to the transfusion of his blood or blood products to the patient. Any arbitrary division in what is essentially a continuous chain of responsibilities must lead sooner or later to disaster.

The problems involved in ensuring efficiency and safety in this field of practice are many and I propose to deal only with some of the most important.

THE PROBLEM OF CO-ORDINATION OF FUNCTIONS

This has already been referred to. In order to underline the fundamental importance of this problem, I would draw attention to the fact that the latest amendment in 1956 to Sec. 83 (*bis*) of the South African Medical, Dental and Pharmacy Act followed directly upon an enquiry into a number of deaths in Cape Town during that year. The deaths were proved to have been caused by bacterial contamination of a large number of bloods, which in turn was attributed to faulty technique in collection. In my view, the inquest findings did not exclude the possibility that the source of contamination may have been from inadequate sterilization of some item of the reusable equipment then employed in the Cape Town Service. Be that as it may, the most important fact which emerged from the enquiry was that there was a serious delay on the part of the hospitals in which the accidents had occurred in alerting the organization responsible for the procurement and testing of the blood to the occurrence of the initial reactions, thereby endangering the lives of many more patients than might otherwise have been the case. The effect of a new sub-section, 83 (*bis*) 1 (*f*), is to make it obligatory on the attendant doctor to report forthwith to the licensed person or organization which supplied the blood, any abnormal reaction in the recipient.

In a similar context, it may be of interest that the New York Academy of Medicine has recently issued a report recommending that a community organization be established to co-ordinate the work of the city's blood-handling agencies. The report draws attention to the 'glaring deficiencies' in the present 'jumble of highly individualistic agencies' engaged in this field and recommends standardization of records from blood donor to recipient. While reliable statistics are unavailble, it is estimated, states the report, that 1% of all blood transfusions performed in the City of New York resulted in untoward reactions, caused either by mismatching, mistyping, mislabelling or the presence of undetected hepatitis.[1]

PROBLEMS OF ERROR

I should now like to deal with some of these *problems of error.* In South Africa the procurement of blood for transfusion has fortunately been restricted in the main to a few responsible organizations. The voluntary blood donor services in this country have all been modelled on the pattern of The South African Blood Transfusion Service so far as donor recruitment is concerned. They are all voluntary blood donor clubs, registered as non-profit companies and controlled in matters of finance, policy and donor recruitment by the donors themselves. This unique form of organization has not only ensured that sufficient blood has always been forthcoming to meet the ever-increasing needs of the sick and injured, but has provided a *cadre* of regular donors, a fact which greatly increases the margin of safety in blood grouping and Rh typing, since each repeat test can be confirmed by reference to the previous records. Technical errors in donor grouping are further minimized by the centra-

lization of all donor tests in one central laboratory and by the use of potent testing sera.

Anti-A and Anti-B sera are obtained by immunizing male volunteers with group specific substances and the testing sera for Rh typing are prepared from the bloods of highly sensitized parturient mothers. The different tests are performed independently on each occasion by two technicians and must be repeated where any discrepancy is revealed. Serological errors in donor grouping and typing are, in consequence, exceedingly rare in our Service. Such clerical errors as occasionally result in mislabelling are caught up by an elaborate system of check and counter-check in the bleeding rooms, grouping laboratory, records control room and blood banks.

Errors from mismatching with the recipient's blood are more liable to occur from one of the following causes:

1. *Mislabelling or inadequate identification of the patient's blood specimen submitted for cross-matching.* It happened in one case that 2 samples of blood were received at the same time for patients with identical names but at different hospitals. One was group O, the other group A. Because of inadequate labelling, the specimens were confused in the testing racks, with the result that the group O recipient received group A blood and the A recipient got O blood. The group O patient died from the resultant haemolytic reaction.

Because of the possibility of confusion of specimens, it is a rule at all major blood banks where technicians are stationed, that the doctor performing the transfusion shall personally check all the tubes in the compatibility rack, identify the patient's specimen submitted for test and perform a rapid grouping, on a tile, of the blood in the patient's specimen tube so as to ensure at least that the blood dispensed is of compatible ABO blood group. Failing this personal check by the doctor concerned, it is our practice to attach a warning label to the bottle. This states that the cross-matching tests have been performed by the technician but, failing personal verification by the doctor, the Service can assume no responsibility. Whether this disclaimer would be valid in law is questionable, but we feel that it does serve to put the doctor on his guard and that it may afford some protection to the technician and to the Service in the event of an accident.

As a further safeguard against confusion of patient's specimens, all transfusions performed are recorded under the patients' names on cards maintained in the blood bank. The cards are retained for one year and are filed alphabetically. It is the duty of the technician to consult this index before performing any compatibility tests and to ensure that the grouping and typing of the specimen supplied correspond with the records, if any, of previous transfusions.

2. *Serological errors due to the presence of irregular antibodies occur even in the hands of experienced technicians.* The comprehensive cross-matching test employed by us has been described in detail elsewhere.[2] It has been designed to detect *inter alia* auto-agglutinins such as might cause difficulty in grouping and matching. The indirect antiglobulin test is also performed routinely and, if the urgency of the case is such as not to permit of waiting for the full incubation period necessary for this test, the result is reported by telephone as soon as it is completed.

As an example of the difficulties which may occur, I may mention a recent case of a group O Rh-negative patient. She had received numerous transfusions overseas and her serum contained a potent Rh antibody. Group O Rh-negative blood was given. Cross-matching failed to disclose any incompatibility. Four days after the transfusion we were notified that she was anuric, although there had been no haemoglobinuria. Retest of the pre-transfusion specimen which, fortunately, had been retained a day longer than is customary in our Service, disclosed the presence of a weakly reacting Duffy antibody, detectable only microscopically by the indirect Coombs test. Despite the very weak *in vitro* reaction with the pre-transfusion specimen, the resulting anuria testified to the severity of the pathological reaction, as did the rapid increase in titre of Duffy antibody in the post-transfusion samples. Errors such as this deserve to be treated sympathetically since they reflect little if any negligence on the part of the technician.

3. Perhaps the most frequent cause of dangerous reactions from serological incompatibility at the present time is that due to *interchange of bottles properly matched* for 2 or more patients in the same ward or operating theatre. To my knowledge at least 3 such instances have occurred with blood supplied by our Service during the past 2 years. In each instance the bottles had been properly and unmistakably labelled with the patient's name, ward and hospital number. One can only conclude that in the hands of certain persons one bottle of blood is the same as any other. Occurrences such as these demonstrate the necessity for some authoritative control being vested in the transfusion services

themselves over the handling of blood in public hospitals and for more intense instruction to medical students and interns in the responsibilities and techniques of blood transfusion. In Johannesburg, a panel of transfusionists is employed by the Service to give all transfusions, other than those administered to free patients in Provincial hospitals. We have found that this system, which has been accepted and welcomed by the profession in Johannesburg and in some other areas where branches of the Service have been established, has not proved so acceptable elsewhere. The system has a great deal to commend it, since it ensures that transfusions are performed by practitioners accustomed to the techniques and fully conversant with all the hazards.

The need for greater appreciation by the medical profession of the dangers and responsibilities of transfusions has recently been aptly commented upon in a commendably well informed paper by a student at Harvard Medical School.[3] He writes as follows:

> 'The average doctor pays little attention to the technique and procedures of blood banking . . . The factor of error is an important one because it has been estimated that the mortality due to blood transfusions in the United States in about one death in 1,000 to 3,000 transfusions. Blood transfusion ranks with appendicitis and anaesthesia as a cause of death.'

THE PROBLEM OF THE 'UNIVERSAL DONOR'

In view of the dangers of blood matching in inexperienced hands, it has been our practice to permit the use of group O, low-titred blood, i.e. so called 'universal donor blood,' in all the smaller blood banks where the number of transfusions required is so small as not to warrant the employment of a permanent blood technician to be available 'around the clock.' In this way, we have been able to bring the facility of emergency transfusions to many small hospitals in the Transvaal, Orange Free State and Northern Cape. Close on 350,000 units of universal donor blood have been transfused in our Service with only 6 reported serious haemolytic reactions. In 2 cases the reactions were attributed to iso-haemolysins in the donor bloods, which had not been eliminated by the screening tests for high titre of iso-agglutinins. Significantly, both patients were A_1B. As a result of this experience, a test for iso-haemolysins was introduced in this Service as an additional screening test for all group O donor bloods. Three other haemolytic reactions were due to the transfusion of Rh-positive blood to sensitized Rh-negative recipients. The sixth was due to a combination of anti-Fy^a and anti-K in a patient suffering from aplastic anaemic who had received numerous previous transfusions.

Wherever universal donor blood is stored, facilities are provided for the grouping and Rh typing of the patient and for the major compatibility test. For the Rh typing, a Diamond box is used and full details are provided for the performance of the simple Rh slide test. Despite these provisions, it is our suspicion that the necessary precaution of testing the patient for Rh type so as to obviate the use of Rh-positive blood for Rh-negative patients is frequently omitted and an incubated compatibility test is seldom performed.

In these circumstances, maximal protection for the patients would, of course, be afforded if only group O Rh-negative blood were stocked in these smaller blood banks; but this is impracticable because this type of blood constitutes only 6% of the total available supply. The best that can be done in the circumstances is to provide Rh-positive and Rh-negative blood in the expected proportions and to urge that these be used with due discrimination. In practice, the supply of Rh-negative blood is often used up first, with the inevitable result that some Rh-negative patients for whom the Rh-negative blood should have been reserved receive Rh-positive blood. A large number of Rh-negative patients are known to have been sensitized as a consequence of such transfusions. Despite all this, it can be stated with confidence that the immediate saving of life from serious haemorrhage has been such as to justify fully the extension of facilities for obtaining universal donor blood for emergencies in the smaller hospitals and remote areas where minimal laboratory facilities exist.

Our own long experience with universal donor blood has received striking confirmation from the fact that only group O Rh-positive blood was supplied to the American armed forces during the Korean campaign. Many thousands of transfusions were given without prior cross-matching and without a single reported fatality being attributed to the use of such blood.[4]

In the past few years, single unit plasma has been made available in addition to universal donor blood. Practitioners in outlying areas have been urged to use this plasma in preference to whole blood whenever possible, so as to permit of time for proper typing and cross-matching of whole blood should this be needed to supplement the plasma infusion. It deserves to be emphasized that the immediate risk to life in the patient suffering from acute

haemorrhage or traumatic shock is not so much the loss of red cells as from hypovolaemia, which can frequently be corrected adequately with plasma alone, thereby rendering the transfusion of whole blood unnecessary in many cases.[5]

PLASMA AND THE HEPATITIS PROBLEM

The use of plasma has been under a cloud since the experience of the Korean War, during which it was found that no less than 22% of the recipients of plasma transfusions contracted homologous serum hepatitis. The cause was traced to the contamination by the virus of large pools of plasma. For the past 8 years our Service has dispensed only single unit plasma.[6] Not a single case of hepatitis following the use of this plasma has so far been reported. It is encouraging to note that this method of preparation has recently been adopted in Switzerland 'to the exclusion of all other methods'[7] and I have little doubt that in due course it will be adopted universally. During the past 2 or 3 years the safety of single-unit lyophilized plasma has gained such widespread recognition in South Africa that difficulty is now being experienced in meeting the demand for this product.

The processing of plasma is, in my view, an essential function of any well organized Service. It permits the storage, without wastage, of sufficient supplies of whole blood to meet any emergency, any surplus being diverted to the preparation of plasma. It also provides an effective substitute for whole blood in most cases of shock and haemorrhage.

THE PROBLEM OF BACTERIAL CONTAMINATION

It is important to realize that blood is an excellent culture medium for pathogenic bacteria. Scrupulous asepsis in its collection and preservation is therefore mandatory. Until a few years ago the dangers of serious toxic reactions due to pyrogens or frank bacterial contamination by far exceeded the risks of mismatching.

This subject was discussed at a special seminar organized by the International Red Cross Society and held in conjunction with the recent International Transfusion Congress in Rome a few weeks ago. Three incidents of large scale contaminations of blood containers were reported to have occurred recently in Denmark, Germany and England. It is highly significant that, in each case, one or more of the items of equipment used in the procurement and storage of the blood required washing and sterilization each time before it was re-used. In one case, also, the seals of the blood containers were inadequate to ensure complete sterility during storage.

With the introduction of commercially prepared, apyrogenic, sterile bleeding sets, containers and giving sets, the hazard of wholesale bacterial contamination of stored blood has been virtually eliminated. No consideration of cost, of convenience or of safety can today justify the re-use of transfusion equipment—at least in civilian practice.

One has but to read the reports and correspondence published in the medical journals of some countries which still adhere to re-usable blood transfusion equipment (and to appreciate the significance of such recommendations as that a drop of blood from the container should invariably be examined microscopically for bacteria before the blood is administered to the patient) to appreciate the magnitude of the risks which the re-use of transfusion equipment entails.

THE PROBLEM OF TRANSMISSIBLE DISEASE

The transmission of disease from donors to patients occurs very rarely indeed when voluntary donors are used, since such persons have no pecuniary motive in failing to disclose a previous history of jaundice or malaria, either of which should disqualify a donor for many years after the attack, if not permanently.

In our Bantu population, the incidence of positive serology suggesting syphilitic disease is very high. Whether this serological phenomenon really indicates pre-existing syphilis in most cases is open to serious question. But be that as it may, the transmission of syphilis by transfusion is a very minor hazard and can be eliminated entirely by storage of all suspected bloods at refrigerator temperature for a period of 96 hours. At present, Europeans constitute well over 90% of the total membership of the voluntary donor services in South Africa. The incidence of positive serology among them is so low as to make the screening test for syphilis largely a formality.

THE RHESUS PROBLEM

As in most other conditions of protein sensitivity, the first exposure to an offending antigen is seldom followed by any perceptible antibody reaction. For this reason Rh-positive blood can generally be infused without any immediate deleterious effect to an Rh-negative recipient. However, it has been demonstrated that Rh sensitization will result in about 50% of such cases. A subsequent transfusion of

Rh-positive blood to the same individual may then precipitate a dangerous or even fatal reaction. In the case of female children or women of child-bearing age, Rh sensitization may be followed by disastrous long-term effects. Should such a woman become pregnant and bear Rh-positive progeny, the foetus may be affected with haemolytic disease with resultant stillbirth or, in the event that the infant is born alive, it may die from kernicterus. Should the infant survive, it may be permanently affected by cerebral damage. Maternal sensitization may, of course, result innocently from pregnancy in women who have never been exposed to sensitization by Rh-incompatible transfusion. However, the incidence of such sensitization is much lower, occurring as it does in only 1 in 30 or more Rh-negative women married to Rh-positive men.

The condition of maternal sensitization can readily be detected by pre-natal serological testing and such tests have been undertaken free by our Service for the past 12 years. Within the past few years our government has itself recognized the essentiality of these tests and they are now available universally as a free public health service to all who wish to avail themselves of it. The importance of the tests is twofold:

Firstly, the knowledge that the patient is sensitized to the Rh factor is an important safeguard in obviating Rh-incompatible transfusions in the future.

Secondly, early treatment of the affected infant by exchange transfusion has effected a dramatic reduction in mortality and morbidity among affected infants.

All too frequently these ante-natal investigations are still omitted, with the result that numbers of cases are still diagnosed only when the jaundice in the infant has assumed considerable proportions and irreversible cerebral damage may already have been sustained.

Practitioners might do well to ponder what their position would be in the event of legal action being taken by an aggrieved woman whose chances of healthy pregnancies had been prejudiced by an Rh-incompatible blood transfusion from omission to perform the necessary pre-transfusion tests, or in the event of loss of life or permanent incapacity in her newborn infant due to the omission of pre-natal tests for Rh sensitization. I recall a case in a Reef hospital some years ago in which a double catastrophe occurred as the result of such omissions. A mother sustained a severe post-partum heamorrhage. Recourse was had to the emergency supply of 'universal donor blood' in the hospital refrigerator. Rh-positive blood was given without previously determining the patient's Rh type. In the course of the investigation of the resultant haemolytic reaction in the mother, it was found that her infant was severely affected by haemolytic disease, but treatment could not be instituted in time to save its life.

PROBLEMS OF GROWTH

I would like to deal briefly with what I may call the problems of growth of a transfusion service. As an example, let me quote the experience of the South African Blood Transfusion Service. This Service commenced operations in December 1937. During the ensuing year a total of 304 units of blood were transfused. In 1957 (i.e. 20 years later) over 64,000 blood donations were received and, not infrequently, more than 300 units of blood were transfused in a single day. In 1938, the transfusions were limited largely to patients in the Johannesburg Hospital; today, this Service caters for the demand for blood of more than half the total population of the country. In our area of operation every first and second grade hospital now has blood and plasma available for immediate use.

What this increased availability and usage of blood and plasma has meant in terms of lives saved is beyond accurate assessment. Deaths from haemorrhage in childbirth, which practitioners of my generation recall so vividly from our student days, are now so rare as to be remarkable, and operations of undreamt-of magnitude are now performed daily with mortality rates lower than those which only 2 decades ago would have been considered satisfactory for appendectomy. Single-unit transfusions are now in a distinct minority and it is not at all uncommon for patients to receive volumes of blood in excess of their total circulatory blood volume during the course of a cerebral or other major operation or for the treatment of a serious haemorrhage.

Without wishing to excuse any of the deficiencies which have existed or which may still exist, it would be surprising indeed if the available resources in donors, trained personnel and necessary amenities did not at times lag behind what might be considered ideal or even essential. The provision of safe and timely transfusions under the various conditions where the need arises—in the villages as well as in the major city hospitals, in the home, on the farm and even down the shaft of a mine—requires an organization which is perhaps impossible of complete attainment. But that, nevertheless, must be the continuous and purposeful aim in the development of such a service.

If failures and accidents should occur at times, these deserve to be considered sympathetically in relation to all the relevant circumstances.

THE PROBLEM OF THE INQUEST INQUIRY

In contrast to most other complications which may ensue in the treatment of a patient, the complications of blood transfusion can usually be traced to their source. Since such complications arise almost invariably from some palpable error of omission or commission, the legal probe can usually pin-point the fault with a high degree of accuracy. Without wishing to detract from the obvious responsibilities of all concerned in the handling and giving of blood to take every reasonable precaution before administering a transfusion it would, in my opinion, be tragic if the fear of legal action arising out of the giving of a transfusion to a patient in urgent need of it should ever result in the withholding of such a life-saving measure. I am not at all convinced that the present system of open inquiry with its full attendant blast of publicity is in the best interests of the public. For the most part, such publicity serves only to frighten the sick in need of blood and to discourage donors. Open enquiries should be held only when there is *prima facie* evidence of negligence or incompetence of such a nature as to merit penal sanction or public exposure.

THE PROBLEM OF REGULATIONS

Draft regulations for the control of blood transfusion practice have been under consideration by the Union Health Department for the past 2 years and their promulgation may be expected soon. Similar regulations exist in many countries. In so far as these serve to codify and standardize certain minimal precautions in the handling and storage of blood and blood products for transfusion, they are certainly to be welcomed. But it is obvious that no regulations can ever succeed in making transfusion safe for the individual patient, for there is no other field of laboratory and clinical medicine in which some small and apparently inconsequential error can so easily transform what should be a life-saving procedure into an irremediable catastrophe.

SUMMARY

The sensible application of our current scientific knowledge of bacteriological and immunological principles in relation to blood transfusion; the correct assessment of the clinical needs of the patient; the proper and intimate co-ordination of all the functions of procurement, testing, storage, processing, matching and infusion of blood and blood products; and the exercise of constant care and vigilance as a conscientious discipline on the part of all who are concerned in any capacity whatever with blood transfusion work—be it clerical, technical or clinical—these are the foundations upon which the pillars of efficiency and safety in transfusion practice may be securely based.

It is my earnest hope that this advice may assist you in your current plans for the improvement and expansion of the Bulawayo and District Blood Transfusion Service.

REFERENCES

1. Editorial (1958): Bull. Amer. Assoc. Blood Banks, **11**, 187.
2. Shapiro, M. (1956): Vox Sanguinis, **1** (New Series), 223.
3. Lipson, C. S. (1957): J. Maine Med. Assoc., **48**, 184.
4. Crosby, W. H. and Akeroyd, J. H. (1954): Blood, **9**, 103.
5. Shapiro, M. (1956): S. Afr. Med. J., **30**, 57.
6. Shapiro, M. (1954): S. Afr. Med. J., **28**, 601.
7. Heiz, R. (1956): Vox Sanguinis, **1** (New Series), 273.

FIRST SOUTH AFRICAN MEDICO-LEGAL CONGRESS

OPENING ADDRESS BY THE PRESIDENT, PROF. S. F. OOSTHUIZEN

DELIVERED AT MEDICAL HOUSE, JOHANNESBURG ON 31 JULY 1958

Ladies and Gentlemen: It has been my pleasure and privilege to take part in the opening proceedings of many congresses, but no other has afforded me the same interest, thrill and anticipation as this one. It is because I suppose lawyers and doctors are so closely allied in combating the troubles of mankind: lawyers as the result of man's quarrels; doctors because of man's ills.

May I express my grateful thanks and appreciation to the sponsors of this congress for the signal honour bestowed upon me by electing me President of this First South African Medico-Legal Congress. I would like to men-

tion Dr. H. A. Shapiro in particular, because it is largely due to his unswerving enthusiasm and spontaneous leadership that this intellectual adventure has become a reality. This congress is a true national meeting, sponsored by the South African Medico-Legal Society and it follows on the 1st International Medico-Legal Congress held in Brussels last year.

This unique experiment of bringing lawyers and doctors together in an arena of mutual challenge, marks a new era in the age-old relationship between doctors and lawyers, and inaugurates a new approach to the problem in South Africa. It has no doubt exercised the attention of the sponsors for some considerable time to attempt to cut the Gordian knot and to bring these professions together with the purpose of bridging some of the important gaps in their professional relationships. It is not only a historic event for the two professions in this country, but also on opportune moment to stage this 'summit meeting.'

In this era so pregnant with startling developments, such meetings are very important, because the pendulum has swung very far towards acceptance of the concept that pooling of knowledge and resources is essential for the service of the modern community as it has gradually emerged out of the shadows of the past age of individualism.

And who can deny that this is the age with a great need for working together, the age where specialization has become so well developed and diverse that consultation and co-operation have become essential. The contributions of the lawyer and the doctor are relatively small, albeit important ingredients of the duties of the various classes of people serving our modern community.

It would be a poor state of affairs if all were clever, or if all were stupid, if all were righteous or if all were bad—if there were no quarrels and no ills.

The public weal is dependent on a veritable *pot-pourri* of changing and alternating facets of human endeavour, a real kaleidoscope of ever-changing concepts and impressions.

In this the lawyer and the doctor have duties of paramount importance to the well-being of the community, as they are part of the basic cross-section of the community itself. Both render a public service and they rub shoulders on numerous occasions and in different walks of life.

It is when professions such as law and medicine develop a kindred spirit, establish a liaison, develop a system of interchange of knowledge about numerous problems of mutual interest, that the best foundation is laid, to determine the spark which sets off the intellectual *sputnik* which contributes so largely in infusing new life and new ideas in the moribund ideology of ancient professions and thus counteracting the onset of intellectual rigor mortis and decay. It is the spark of the new idea which may set the lawyer to think of problems other than those of logic and procedure, and the doctor of problems related to histories and clinical symptomatology and thereby to open the door to a better understanding of more of the fundamental problems of life itself. Out of an appreciation of the problems besetting the life of the lawyer and the doctor, important decisions may emanate which may quite well affect the attitude of both professions in the field of education, research and ethics and thereby inevitably have a salutary effect on the interests of the public.

Glen Frank once said:

'The dullard must wait for events to overtake him. He lacks the sensitive imagination and deciplined powers of analysis to enable him to anticipate and to discount events. With all his failings he may nevertheless be classified technically as a learned man, but lacking insight and understanding, his learning becomes wasted. Down the ages the capacity to anticipate and to discount bad ideas and the capacity to sense in advance and to appropriate good ideas, without waiting for events to indicate their badness or their goodness, has been considered the supreme achievement of Man as a thinking animal.'

In approaching our duty towards mankind, as lawyers and doctors the importance of this philosophic point of view cannot be sufficiently stressed. To succeed as a lawyer, is difficult, but possible; to succeed as a doctor, is possible but difficult; but to contribute something revolutionary and new is with most of us a mere Utopia.

By coming together as lawyers and doctors, the thoughts and the challenge of thinkers may assist in the birth of new concepts and new ideas.

People know accurately only when they know little; with knowledge, doubt increases. Intellectual stimuli may increase this doubt, which is a precursor to progress.

With this background, viz. that it is well worth while in the public interest that lawyers and doctors should work more intimately together as servants of the community, it may be fruitful to briefly refer to some of the matters where they can make a contribution either in the form of a pooled effort, or independently. May I take as example some of the duties of the S.A. Medical Council charged by the legislature with wide powers and

responsibilities. The Medical Council functions mainly in the fields of medical education and ethics. In both fields the work of the Council often overlaps that of the legal profession.

It is perhaps the most difficult task of all for any professional body to have unfettered delegated powers entrusted to it by Parliament.

In the field of education, quite apart from the more general duties, the Council is expected to lay down minimum standards for the university which undertakes the training of medical practitioners. These standards include *inter alia* a knowledge of the responsibility of the medical man towards his patients and professional brethren, a knowledge of certain Acts of Parliament and the regulations framed thereunder, a knowledge of diverse medico-legal problems, some of which have been wisely included in the programme of the this Congress. In my opinion, to adopt parrot-wise the practices of the past, will lead nowhere and will merely serve to place a further burden on the already overloaded curriculum. Will it not be wise to have a practical system of liaison with legal people to assisting the framing of the medical curriculum as far as the interests of the two professions are concerned?

In the field of medical ethics, the Council is empowered to function as the main custodian of the honour and dignity of the profession. It is common knowledge that many of the ethical rules of the Council have developed from the ancient traditions in which medical practice is so deeply steeped. The Medical Council has to judge, whenever there is a complaint, whether it constitutes improper or disgraceful conduct; and in the event of a decision that there is *prima facie* evidence of unprofessional conduct on the part of the practitioner, it has to hold an open enquiry and arrive at a finding after hearing evidence from the complainant as well as the accused.

This is often a difficult task to fulfil for a quasi-judicial tribunal, a tribunal not necessary with knowledge of law but which nevertheless holds the professional life of the accused in its hands. Will it not be advisable to evolve some mechanism whereby some of the well-known difficulties can be discussed by lawyers and doctors acting as professional colleagues in the service of the public?

Many of the ethical codes of the medical profession may appear ludicrous to our learned colleagues. The Council insists that a name plate should not be of greater dimensions than 17″ × 14″. This may appear unfair in the eyes of the legal profession, which may well contend that the public may be in a better position to see a larger plate. The Council further stipulates that it is unethical for a doctor to practise in a chemist shop. To the learned judge this may appear unreasonable. Is there not the possibility that mutual contact and understanding of the problems of the doctor may remove any confusion which may exist in the minds of other interested parties?

A co-operative effort between the two professions in the field of research, may also be profitable. Any institution not imbued with the spirit of research is like a body without a soul. This applies also to our professions. South Africa is a veritable natural laboratory presenting unparalled opportunities for research in the field of problems of environment and of geography. Numerous problems of a medico-legal nature exist and need the attention of our professions for their solution in the interests of the public.

It is a great pity that it is not possible to establish closer intellectual contact with the different related disciplines at the universities; actually there is great room for improvement even on an inter-faculty basis.

An unanswerable case for stimulating an alliance of interested persons can be made in the case of law and medicine in the interests of progress and so repudiate the statement of Oscar Wilde which has held us in a firm grip for so long:

> 'Each of the professions means prejudice. The necessity for a career forces everyone to take sides. We live in the age of the overworked and the under-educated, the age in which people are so industrious that they become absolutely stupid.'

Lawyers and doctors constitute but a small percentage of the population, and it may quite well be doubted how any co-operative effort on their part may influence the destinies of mankind. Let me remind you that the minorities always hold the key to progress, and that it is always through those who are unafraid to be different that advance comes to human society.

It is my sincere hope that legal people and doctors will acclaim this new development of close co-operation as professional bodies, so as to stimulate new ideas out of which may be born medico-legal intellectual satellites, penetrating beyond our professional horizons which have become outmoded and stereotyped.

My best wishes to the sponsors of this Congress for a fruitful series of discussions and my heartiest welcome to all of you who have been interested in attending this first Congress of its type ever to be held in South Africa.

THE PROBLEM OF THE MENTALLY RETARDED

M. MEDALIE, M.R.C.P.E.

and

N. SHNEIER, B.A. (SOCIAL STUDIES)

Johannesburg

Mental retardation is a vast problem, not only in South Africa, but all over the world. Not only is it a great tragedy for the victim, but the whole family is also involved personally, financially and socially. The nation as a whole has a responsibility to face, and the country must assume responsibility for the less privileged members of our community.

The mentally retarded may be defined as those persons who are unable to make a satisfactory and independent adaptation to the ordinary environment of their fellows. A definition based on scholastic ability or on an intelligence quotient is frequently fallacious. Some show poor scholastic ability and yet can live independent lives. Adaptation to everyday living in many cases does not parallel the intelligence quotient, although this test is useful in aiding diagnosis.

The various grades of retardation are frequently complicated by associated defects such as cerebral palsy, epilepsy, blindness or deafness. The parents in such cases unfortunately believe that if the associated defect is corrected, the child will make a satisfactory adjustment to society.

In this paper the personal tragedy of a few cases will also be briefly mentioned to stress the urgency of the problem. Perhaps an even greater tragedy is the lack of facilities, both official and private, which exist for the mentally retarded. In many instances the accommodation is overcrowded and the staff overworked. A great deal of criticism is often expressed by parents against various institutions. This criticism can often be ignored as the parents are emotionally involved, and tend to exaggerate the deficiencies which exist; but when the criticisms are oft-repeated, one realizes that a greater amount of supervision is not only necessary, but absolutely essential. Doctors, psychologists and social workers who are constantly working with these children need to visit the institutions to see what the true state of affairs is. Government institutions are, of course, better able to cater for these children, and the sooner they accept the responsibility for their care, the better for all concerned. The number which are institutionalized is a small percentage of those affected.

Incidence. Before the problem can be tackled adequately, it is essential to have an idea of its extent. This is most difficult to ascertain, but for the purpose of discussion, two series of surveys are worth quoting.

In 1926, in England, a survey was undertaken by Dr. Lewis, who found that in a number of areas with a total population of 622,880, there were 5,334 defectives. This is an incidence of 8 per 1,000 of the population. Every 100 retarded persons comprises 5 idiots, 20 imbeciles and 75 feebleminded.

In a number of American surveys approximately similar figures were obtained.

With these figures as a basis, South Africa (with a total population of 13,915,000) would have about 111,320 retarded persons. If the Whites only are considered, then with the population of 2,907,000, the number of cases would be about 23,256. These figures are most illuminating when the number of beds available is considered.

Accommodation: (*a*) *Departmental Services.* (See the *Official Year Book of the Union of South Africa,* No. 27, 1952–53, pp. 246 *et seq.*).

'The administration and establishment of mental hospitals and institutions for the feeble-minded, and the licensing and inspection of private homes for mental patients, are functions of the Department of Health, and fall under the control of the Commissioner for Mental Hygiene. Psychological research and the standardization of intelligence tests for various racial groups are conducted by the National Bureau of Educational and Social Research of the Department of Education, Arts and Science, as well as by the National Institute of Personnel Research, a section of the S.A. Council for Scientific and Industrial Research. The education and training of sub-normal children of school-going age falls under the Education Departments of the Provincial administrations, which provide psychological services for intelligence testing, and vocational guidance to varying degrees in the different provinces.'

The following figures give some idea of the numbers. They are quoted from the *Annual Report* of the Commissioner for Mental Hygiene, 1954 (U.G. No. 9/1956).

NO. OF MENTALLY DEFECTIVE PERSONS ON 31 DECEMBER 1954

Institutions for the Feeble-Minded	*Europeans*		*Other Races*		*Total*
	Male	*Female*	*Male*	*Female*	
	1,253	1,165	1,011	—	3,429
Licensed Houses	72	141	25	27	265
Under Single Care	6	6	4	3	19
Institutions for Mental Defectives					
Witrand Institution, Potchefstroom, Transvaal					1,338
Alexandra Institute, Maitland, Cape Province					863
Umgeni Waterfall Institution, Howick, Natal					271

These are the 3 Government Institutions which admit only those cases certified as feeble-minded within the meaning of the Mental Disorders Act. As mental defect is incurable, most of the patients stay there for the rest of their lives. This means that there is very seldom a vacancy. The Commissioner for Mental Hygiene comments:

'It is truly a shocking state of affairs that, because of financial stringency and other reasons, adequate facilities are not being provided for the treatment of the mentally ill in this country.'

(*b*) *Voluntary Services. The Official Year Book of the Union of South Africa,* 1952–53, states:

'The S.A. National Council for Mental Health is the recognized representative body dealing with all types of preventive, promotive, after-care and rehabilitative mental health work, and the development of an informed public opinion with regard to preservation of mental health. The Council establishes mental health societies which employ qualified social workers and conduct free local out-patient clinics with the assistance of Government psychiatrists. . . . Mental health societies exist in Johannesburg, Cape Town, Pretoria, Durban, Pietermaritzburg, East London and Kimberley. . . . The Witwatersrand Society runs an occupational centre for backward youths, and a licenced after-care hostel for females discharged from mental hospitals. The Cape society conducts a child-guidance clinic for non-Whites, and runs a home for feeble-minded Coloured children. The East London society has a training centre for backward and high-grade feeble-minded children. The Durban society runs a club for the same type of children, and the Pretoria society one for the children of normal intelligence. The Council is now investigating the possibility of periodic clinics in the rural areas in co-operation with the societies.

Licensed Nursing Homes for Mental Defectives. These homes have children committed on certificate, for whom they receive a government grant of 3s. 10½d. a day. Some of them will take uncertified children as well. The difficulty with these homes is that their fees are up to £30 a month, excluding bedding and clothing, and many parents cannot afford to pay as much. If the institution does not receive payment for every child, it is handicapped in giving the children the best attention. There is also a shortage of properly trained staff, as most have to be trained overseas. The lack of funds means that the staff cannot be adequately paid. It also means that accommodation is not as good as it should be. The patients stay in these homes for the rest of their lives unless alternative accommodation can be found. Emphasis is placed on the training of the inmates as opposed to academic training. They are taught crafts, housework, farming, etc.

The *Report of the Commissioner for Mental Hygiene,* 1954 (U.G. 9/1956) reveals the following facts:

CAPE PROVINCE

Name of Home	*No. of Beds.*
Adam's Farm Retreat	30
St. Mary's Training School, Claremont	30
Garden Village	12
Rudolph Steiner School ..	22
St. Ephrasias Home	20
Somerset, East London	4
	118

NATAL

Name of Home	*No. of Beds*
Mount Marion Training School ..	4
Sunfield Children's Home	20
	24

TRANSVAAL

Name of Home	*No. of Beds*
St. Joseph's Training Home ..	20
Irene Homes, Irene	25
San Michele Home, Boksburg ..	18
Netta Levine Home, Johannesburg	11
Harmoney Home, Mapleton ..	24

TRANSVAAL

Name of Home	*No. of Beds*
Magaliesburg Children's Home ..	20
Armstrong Berning Tehuis, Pretoria	10
	128

There is also an unlicensed home in Johannesburg, the Woodside Sanctuary, which will take 15 children at present. They are hoping to expand, but also suffer from scarcity of funds.

TYPES OF RETARDATION

The mentally retarded may belong either to the primary types, i.e. there is a specific defect of germ plasm, or there may be some secondary factor which may operate later on in life. The primary types are those suffering from mongolism, microcephaly, tuberose sclerosis and craniosynostosis. This latter type must be distinguished from the microcephalic, because frequently an operation on the skull early in life may prevent mental retardation. Another type of primary defect is the phenylketonuric, who suffers from a disturbance of metabolism. Apparently it is due to intoxication by phenylalanine. By restricting the amino acids in the diet, surprising improvement has been noted. (See *Year Book of Pediatrics,* 1955–56, pp. 56–59). The diagnosis is rapidly and easily made by adding 5% ferric chloride to urine, when it turns deep green in 5 minutes in a positive case. This test should be routine in all infants showing a disturbance of mental function.

The secondary types are of importance, e.g. in cases of meningitis which have been neglected even for 24 hours, there may be resulting irreversible brain damage; whereas correct and vigorous therapy for the different types of meningitis will most often result in a normal child. Another example of a secondary type is the kernicteric child. This is preventable if all pregnant Rh negative mothers are carefully followed and blood replacement given early when indicated.

DEGREES OF MENTAL RETARDATION

(*a*) *Idiots.* Idiocy is that group which manifests the greatest degree of mental retardation, and may be defined as including those children who are unable to defend themselves against common physical dangers. Often these persons have associated defects such as paralysis, weakness or convulsions. They often have defects of perception, e.g. of hearing, sight or taste. Their attention span is short and memory poor. Idiots have to be washed and fed and are inattentive to toilet demands. Speech is usually absent, and at times they emit grunts and peculiar sounds. Some are quiet and apathetic and easily managed. Others are excitable and destructive. If locomotion is impaired, they may have slow, recurring automatic movements.

The degree of disability is assessed early, but unfortunately parents become morbidly attached and overprotective, believing that they are the only ones who understand their children, and that they would be neglected in any institution. In some instances, the parents believe that the primary disability is the associated one of cerebral palsy or hearing loss and that, if this is overcome, their children could eventually lead useful lives. This misunderstanding is often unconsciously fostered by various agencies which are prepared to tackle this associated defect, be it cerebral palsy or speech therapy. Progress, of course, is negligible, if the mental retardation is the primary defect.

(*b*) *Imbeciles.* These may be defined as those who are incapable of earning a living, but are able to protect themselves against physical dangers. They have a vacant facial expression, often with peculiar physical characteristics. Their movements are clumsy and ungainly.

In taking a history, it is often found that these children were quiet and unresponsive in infancy, slow in learning, feeding and toilet training. They walk at a late age and are often 5 or 6 years old before they use words correctly. At school they are incapable of doing simple arithmetic, or even reading. They follow simple commands, dress themselves and learn to avoid common physical dangers. When quiet, they are inoffensive and well behaved, but if excitable, they are offensive and often uncontrollable. Under close supervision they perform everyday acts of washing, sewing or gardening.

(*c*) *The Feebleminded.* These are defined as those children who are incapable of deriving benefit at ordinary schools, provided the inability to learn is not due to some other disability, as later described under pseudo-feeblemindedness. The children in this group mostly have an I.Q. below 70. In many instances nothing abnormal may be detected until they enter school, although, on careful questioning, it is found that they may have been slow at walking or speaking. They have no interest or curiosity in or understanding of everyday happenings. The physical defects are usually absent, although there may be slight microcephaly. Speech disturbances are frequent and their movements are clumsy. They are inattentive and memory and concentration powers are poor. Occasionally the memory is extraordinarily good, and this gives

a false impression of intelligence. They can learn to read and write, but make very little further progress at school. If quiet and passive, they are manageable, but if they become excitable, or are emotionaly unstable, they are a trial to care for.

When these children attend special classes or schools, and are under the protective wing of parents, everything is reasonably satisfactory. If home conditions are unsuitable, then placement in a Government institution is essential.

(*d*) *Pseudo-Feeblemindedness.* A number of conditions at times give the examiner a feeling that mental retardation is present, but if the various possibilities are borne in mind, most of the disabilities can be diagnosed and appropriate therapy instituted. If left undiagnosed, no progress occurs at school, and they are labelled mentally retarded when in fact there is some cause which can be treated with resulting improvement in the mental condition.

In a previous article* on the sociological implications of cerebral palsy, the incidence of mental retardation in the cerebral palsied was found to be 50%, i.e. individuals with an I.Q. of less than 70. Theoretically, the remainder have a higher I.Q., and should be educable, but because of severe physical disability this is actually not the case. The severely disabled are unable to sit, speak or feed themselves. Often, after a prolonged period of training in a cerebral palsy centre, they make little or no progress. Those who fail to progress after a reasonable period may be better placed in an institution. In spite of any physical disability, it is essential to remember that the ordinary intelligence tests can be satisfactorily administered by a well trained psychometrist.

Children suffering from aphasia, often considered mentally retarded or deaf, must be carefully excluded from the true retarded group. The hearing faculty is normal in intensity and pitch, but they are unable to understand the spoken word. The condition is rare, but can be suspected in an individual whose educational progress is suddenly arrested following trauma, haemorrhage, shock, or infection.

Closely allied to the aphasics are the children who have a specific disorder of reading, as described by Bakwin and Bakwin. Until they enter school, these children are often considered bright. At school, they are unable to read. There is sometimes an associated disturbance of speech, and often the children are clumsy and untidy. Their movements are jerky and uncoordinated. Because of the disorder, the children become anxious and unhappy, as they feel stupid and inferior. The difficulty is not visual but appears to be a disturbance of comprehension. This condition must be considered when the general intelligence of the child appears to be good.

Children who have severe speech disorders often appear to be mentally retarded but, in these instances, testing in other spheres is normal. Speech is always absent in the deaf child, but often the bright child who is deaf can conceal this disability in spite of careful testing, until he is 4 or 5 years old. If a child does not speak at 2 or 3 years, and his hearing is normal, then the parents can be reassured that eventually he will talk.

Psychologically disturbed children often fail to make progress at school and may often be presumed to be mentally retarded. These children are often diagnosed by the psychologist because, on taking the test, results show a great deal of scatter. Schizophrenic children are rare, but this possibility must be considered in a child who is normal up to a certain age and then spontaneously undergoes a marked change in character and behaviour.

(*e*) *Special School Child.* (See *Transvaal Education Bureau, Vol.* 1, *No.* 4, *pp.* 171–182, *December* 1956).

The children who have an I.Q. of 70–90 fall outside the range of the mentally retarded, but are those who are unable to compete with the children of the same age, and are placed in special classes or schools. This problem is understood by the Transvaal Education Department, which is making efforts to train these children in marginal skills so that they may eventually play their part in society as semi-skilled or unskilled labourers. Only by extending these facilities will it be possible for the normal child to receive adequate education, because the pace of education at any level depends upon the rate of progress of the slower members. The only criticism which can be levelled at this system is that children with an I.Q. below 70 are sometimes placed in special classes, whereas the system has been specially designed for the more intelligent child, i.e. the group between 70–90. In spite of this criticism, it is commendable that the Education Department is doing something for many of our feebleminded children. 'At the end of June 1952, 1,642 pupils attended special classes and schools for backward children.' The *Year Book,* 1952–53 states:

'In June 1952 in the Cape there were 328 special classes for sub-normal and backward children with

* Medalie, M. (1956): S. Afr. Med. J., **30,** 7.

a total enrolment of 4,235. . . . Hunt Rd. Government School, Durban, and St. Elmo's Government aided school, Umzumbi, as well as special classes in various Government schools cater for mentally retarded cases (Europeans only).'

PERSONAL HISTORIES

Case 1. John, aged 6 years, was seen because the parents had become desperate and did not know where to turn. At the age of 2 years he was first hospitalized because of otitis media. At that time, a hearing loss was suspected and tonsillectomy and adenoidectomy were advised. This was performed, but no improvement resulted. The parents were then told that the deafness was central in origin, and that he should attend a special school for the deaf. They moved from a coastal town to Johannesburg and the child was admitted to a deaf school, but was not kept there as he developed temper tantrums, screaming attacks and was generally unmanageable. He was then examined by neuro-surgeons who performed a ventriculogram and a brain biopsy, but nothing specific was determined. The parents next tried a cerebral palsy school, but he was not considered a suitable candidate. He was then taken to a special school for retarded children, but after a trial period was found to be unmanageable. According to most of those who have attended this child on various occasions, he is definitely retarded mentally, is grossly psychologically disturbed and also deaf. He therefore has to be institutionalized.

Case 2. Alan is an only boy of elderly parents. He sat at 15 months, walked at 30 months, and at 5 years hardly speaks. At 2 years he developed uncontrollable fits, sometimes 5 or 6 a day. The parents believed that if his fits were controlled he would improve mentally. Eventually the convulsions were controlled, but after a 6-month fit-free period, he showed no mental improvement. The parents now realize the hopelessness of the case, and want him institutionalized.

Case 3. Joan is a normal healthy baby, the labour was normal, but at 2 months the child had a severe attack of encephalitis. She only walked at 4 years, her speech is unintelligible and she has a severe degree of cerebral palsy. She attended a school for cerebral palsy for 5 years. No improvement was noted. A great number of faith healers and masseurs have treated her without success. At 14 years, the parents (who have no other children) want her placed in a good institution where she will be well housed and cared for.

Case 4. A normal little girl of 2 years contracted tuberculous meningitis, and after 2 years in hospital was discharged blind, deaf, dumb, paralysed and with severe fits which occurred at night. She screams during these fits. She is the youngest of 6 children, and both parents have to work. They have very little sleep during the night, and consequently their health is deteriorating. They cannot afford to keep a servant to help with the child. The grandmother, who is very old and feeble, has to care for her in the mornings. When the older children return from school, they have to look after her, which is putting an unfair strain on them. She has been put on the waiting list for a Government institution, but there will be no vacancies for the next 5 years. There is a local institution which will take her, but they have no facilities for a child who screams all night; neither can they subsidize parents who cannot afford the whole monthly payment necessary.

Case 5. Mrs. S. was living with her husband in Cape Town. They had a baby suffering from cerebral palsy and mental retardation. The husband deserted and came to live in Johannesburg. His wife followed him, hoping that he would support her whilst she stayed home to care for the child. In Johannesburg she discovered that her husband had been gaoled, and that he refused to maintain her in any case. Her mother-in-law refused to care for the child, and the mother was forced to seek work. A Native servant was employed to watch the child, who is very passive, but she was most unsatisfactory as she neglected her altogether. Finally, she was placed in an institution, but the mother pays fees which form a large part of her earnings. This child's name has also been put on to the waiting list of the Government institution, but she will also have to wait about 5 years for admission.

Case 6. Roy, aged 10, comes from a broken home. The mother has recently been certified. The child contracted streptococcal meningitis and, after prolonged treatment, apparently made a good recovery. He is a little clumsy in his movements, but can feed and dress himself, and speaks very well. In fact, when he entered an ordinary school at the age of 6 years, he had the vocabulary of a child of 8. It was soon found that he had a severe agraphia (inability to write even the simplest figure) and also had a complete reading loss. As he was still a little clumsy, he was placed in a cerebral palsy school and slowly, under expert guidance, his disabilities have been assessed, and marked improvement has resulted after a very long period of therapy. This case can be classified as pseudo-feebleminded.

SUMMARY AND CONCLUSIONS

The incidence of the mentally retarded child is obtained by inference from English and American figures. This reveals the appalling lack of facilities for these children in the various institutions. This applies to the White population. When the non-Whites are considered, the provision of institutions is virtually negligible. A mere token accommodation is provided.

A few histories are briefly summarized to emphasize the tragedy for the families involved. The great effort that is made by the parents is apparent, but eventually they are forced to turn for help to various institutions. They are not accommodated because of lack of beds and finance.

Overcrowding in the Government institutions is commented on by the Commissioner of Mental Hygiene. The part played by the voluntary organizations is small indeed, and greatly handicapped by financial stringency and lack of trained personnel. The State should immediately assume full responsibility, or else supply a sufficient subsidy to enable private institutions to cater for these children adequately and efficiently.

When facilities become available the various types will have to be diagnosed carefully, so that the so-called 'pseudo-feebleminded' case is placed in his correct environment.

OPSOMMING

Die persentasie geestelik vertraagde kinders in ons land kan min of meer van die Engelse en Amerikaanse syfers afgelei word. Dit dui onteenseglik aan dat daar 'n ontsettende gebrek aan fasiliteite vir hierdie kinders in die verskillende inrigtings is. Dit geld vir die blanke bevolking. Wat die nieblankes betref, bied ons inrigtings byna hoegenaamd geen fasiliteite aan nie. Aan 'n baie klein aantal word akkommodasie verskaf—maar dis ook al.

'n Paar siekteverslae word aangehaal om die tragedie van die betrokke gesinne te beklemtoon. Dat kragtige pogings deur die ouers aangewend word, is duidelik, maar uiteindelik word hulle tog gedwing om om hulp by die verskillende inrigtings te gaan aanklop. Geen akkommodasie kan verskaf word nie omdat daar 'n tekort aan beddens en geld is.

Die Kommissaris vir Geestesgesondheid het reeds kommentaar uitgeoefen op die feit dat die staatsinrigtings oorvol is. Vrywillige organisasies speel net 'n baie klein rol en is grotendeels gekniehalter deur 'n gebrek aan geld en opgeleide personeel. Die Staat behoort onmiddellik volle verantwoordelikheid te aanvaar. So nie moet die Staat 'n subsidie toestaan wat groot genoeg is om private inrigtings in staat te stel om op 'n doeltreffende manier in die behoeftes van hierdie kinders te voorsien.

Namate fasiliteite beskikbaar gestel word, sal dit nodig wees om die verskillende tipes sorgvuldig te diagnoseer sodat die sogenaamde ‚pseudo-swaksinnige' kind in sy regte omgewing geplaas kan word.

REFERENCES

Tredgold, A. F. (1952): *A Textbook of Mental Deficiency*, p. 13. London: Baillière, Tindall and Cox.

Bakwin, H. T. and Bakwin, R. M. (1953): *Behaviour Disorders in Children*. Philadelphia: W. B. Saunders Co.

PREPARATIONS AND APPLIANCES

TRILAFON REPETABS

TRANQUILLIZER AND ANTI-EMETIC

Schering Corporation announces a new form of their well-known tranquillizer and antiemetic, *Trilafon*. In keeping with the modern trend to avoid repeating doses, *Trilafon* is now compounded as a Repetab, each Tablet containing 8 mg. of perphenazine. The dosage is equally divided; 4 mg. in an outer layer for immediate absorption, and 4 mg. in an inner core for release approximately 4 to 6 hours after ingestion.

Advantages: *Trilafon* Repetabs extend the tranquillizing and antiemetic effects of *Trilafon* throughout the day or night following a single dose. They are of particular value in conditions or situations when an uninterrupted therapeutic effect from a single tablet is desired and when maintenance dosage has been established. *Trilafon* Repetabs assure continuous medication by minimizing risk of 'forgotten' doses and relieve distressed patients of dosage worries and complicated directions. In hospitals, they relieve nursing personnel of extra work.

Indications: *Trilafon* Repetabs are indicated especially when a prolonged tranquillizing effect is desired in the management of anxiety, tension and psychomotor overactivity. They are also highly effective in providing prolonged antiemetic effect in the control of hyperemesis gravidarum and simple nausea and vomiting of pregnancy; nausea and vomiting due to gastro-enteritis, postoperative states, carcinomatosis, drug or radiation therapy and psychogenic factors.

Dosage: As with all potent drugs, the best dose is the lowest dose which provides the desired clinical effect, and each patient should be treated individually.

Simple Anxiety and Tension States: One *Trilafon* Repetab administered once or twice daily is generally adequate. A total daily dose of more than two *Trilafon* Repetabs is seldom required to elicit a favourable response.

Moderately Disturbed Out-Patients: One or two Repetabs morning and night, provides the usual total daily dose of 8 to 32 mg. in ambulant psychiatric out-patients.

Hospitalized Psychiatric Patients: Two to four Repetabs morning and night depending on severity of symptoms and individual response is the usual dosage range. Total daily dose of 64 mg. should not be exceeded.

Nausea and Vomiting: Two Repetabs may be administered initially in acute cases. The average dose is one Repetab administered morning and evening.

Dosage in Children: One *Trilafon* Repetab may be given morning and evening to children over twelve years of age to provide tranquillization or antiemetic effect.

Precautions and Contraindications: Patients receiving *Trilafon* should be kept under regular observation. Agranulocytosis has not been reported with *Trilafon*, but the possibility of bone marrow depression such as has been observed with other phenothiazine drugs cannot be ruled out. Leukopenia or other evidences of bone marrow depression are contraindications to the use of the drug. The antiemetic effect of *Trilafon* may obscure signs of toxicity due to overdosage of other drugs or render more difficult the diagnosis of disorders such as brain tumour or intestinal obstruction. *Trilafon* is contraindicated in depressed conditions whether psychic

in origin or resulting from depressants of the central nervous system such as barbiturates, alcohol, narcotics, or similar drugs. A significant rise in body temperature not otherwise explained may suggest individual intolerance, in which event the drug should be discontinued.

As with other phenothiazine drugs, *Trilafon* should be used with great caution in patients with a history of convulsive disorders and patients who have exhibited severe side actions to other phenothiazine drugs should be under constant supervision.

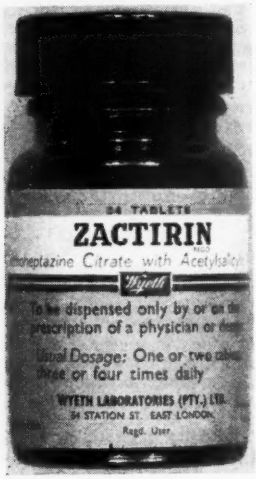
Extrapyramidal symptoms have been observed at times closely simulating the Parkinson syndrome, but these manifestations have disappeared within 48 hours following decrease in dosage or withdrawal of the drug, or if necessary, the administration of anti-Parkinson drugs.

Further information and trial material may be obtained from: Scherag (Pty.) Ltd., P.O. Box 7539, Johannesburg.

ZACTIRIN

A NON-NARCOTIC ANALGESIC AS EFFECTIVE AS CODEINE

The Product: *Zactirin*—a potent, non-narcotic analgesic containing the new chemical compound, ethoheptazine, proved as effective as codeine in relieving moderately severe pain (i.e. pain too severe to be relieved by aspirin or APC compounds, but not severe enough to warrant morphine-like drugs). *Zactirin* does not produce any of codeine's undesirable side effects (constipation, dizziness, nausea, etc.) and it is *non-addicting*.



Use of the Product: *Zactirin* has been found particularly effective in the relief of low back pain and pain of minor traumatic injuries, joint pains and related disorders (arthritis, bursitis, neuralgia, synovitis, etc.), abdominal, perineal, and menstrual pains, and post-operative and dental pains.

Formula: Each distinctive yellow and green *Zactirin* tablet contains 75 mg. ethoheptazine citrate (yellow layer) and 5 gr. acetylsalicylic acid (green layer).

Dosage: For moderate to moderately severe pain, 2 *Zactirin* tablets, 3 or 4 times daily, is the suggested routine dose.

For mild pain, 1 *Zactirin* tablet 3 or 4 times daily, may suffice. The total daily dosage should not exceed 8 tablets.

Supplied: Tablets, bottles of 24.

Manufacturers: Wyeth Laboratories (Pty.) Ltd., P.O. Box 8138, Johannesburg.

MAREVAN

AN ORAL ANTICOAGULANT

Evans Medical Supplies announce the availability of *Marevan* and provide the following information.

Marevan (Warfarin Sodium, Evans) is an oral anticoagulant. A clinical trial on a series of 175 patients showed that *Marevan* is extremely easy to control as there is very little fluctuation in individual dosage schedules. The initial dose was 35–40 mg. for seriously ill patients and those over 75 years; 40–50 mg. was given to more robust patients under the age of 75. A therapeutic level of prothrombin was reached in 36 hours. The first maintenance dose was given on the third day. The daily dose required to maintain the prothrombin time at 2½ times normal varied from 2–15 mg., the overall average being 9 mg.

The daily variations of dosage necessary are small, as little as 0.5 mg. usually causing a change in the prothrombin time. Because the effect of such variations is not apparent for some 36 hours, the dose is best considered in terms of a 3-day cycle so as to maintain the prothrombin time most consistently at the optimum level. The strengths of *Marevan* have been so designed that the total dose for such a 3-day period may be given with the minimum daily variation. Thus the minimum variation in the 3-day dose is provided by the addition or withdrawal of half a 3-mg. tablet over the period. On the other hand, using both tablets, any specified dose may be given exactly to 0.5 mg.

Marevan is available in tablets of 3 mg. (coloured blue) and 5 mg. (coloured red) in containers of 100 tablets. The 5 mg. tablet is primarily intended for the initial dose. With the degree of control which can be established with the 3 mg. tablet, it should rarely be necessary to use 5 mg. tablets for maintenance therapy.

Distributors: Evans Medical Supplies, P.O. Box 6607, Johannesburg.

REFERENCE

Toohey, M. (1958): Brit. Med. J., **2**, 892.

NOTES AND NEWS : BERIGTE

Dr. J. Leibovitz, M.B., B.Ch. (Rand), D.A. (R.C.P. & S.), F.F.A.R.C.S., has commenced practice as a Specialist Anaesthetist at 301 Pan Africa House, Corner Troye and Bree Streets, Johannesburg. (*Telephones*: —*Rooms*: 23-2885; *Residence*: 25-5922).

• • •

Dr. J. Leibovitz, M.B., B.Ch. (Rand), D.A. (R.C.P. & S.), F.F.A.R.C.S., het begin praktiseer as Narkotiseur te Pan Africa-gebou 301, hoek van Troye- en Breestraat, Johannesburg. (*Telefone*: *Spreekkamers*: 23-2885; *Woning*: 25-5922).

Dr. Louis du Plessis has commenced practice as a Thoracic Surgeon at Florence Nightingale Building, Kotze Street, Hospital Hill, Johannesburg. (*Telephone*: —44-8837).

• • •

Dr. H. H. Eiselen, of the Union Health Department was one of 6 medical officers from the WHO African Region invited by the Organization on a group fellowship study tour of the U.S.S.R. (from 15 October to 22 November).

The total group of 23 participants will visit numerous medical and health centres in Moscow, Leningrad, Kiev, the Georgian S.S.R. and the Uzbek S.S.R., particularly the region of the Black Sea shores.

PREPARATE EN TOESTELLE

TRILAFON REPETABS

KALMEER- EN BRAAKTEENMIDDEL

Schering Corporation kondig die beskikbaarstelling aan van 'n nuwe vorm van hul bekende kalmeer- en braakteenmiddel, *Trilafon*. Op een lyn met die moderne neiging om herhaaldelike dosisse sover moontlik te vermy, word *Trilafon* tans aangebied in die vorm van 'n „Repetab,' en iedere tablet bevat 8 mg. perfenasien. Die dosis is gelyk verdeel: 4 mg. in die buitenste laag vir onmiddellike opneming, en 4 mg in die binneste kern vir vrystelling ongeveer 4 tot 6 uur nadat die tablet geneem is.

Voordele: 'n Enkele dosis *Trilafon Repetabs* versprei die kalmerings- en braakbestrydende effek van *Trilafon* oor 'n hele dag of nag. *Trilafon Repetabs* is van besonder groot waarde in toestande of situasies waar 'n voortdurende terapeutiese effek op die toediening van 'n enkele tablet verlang word, en waar die instandhoudingsdosis vasgestel is. *Trilafon Repetabs* verseker ononderbroke behandeling deur die gevaar van ‚vergete' dosisse uit te skakel, en siek pasiënte van bekommernis oor dosisvoorskrifte en ingewikkelde gebruiksaanwysings te bevry.

Indikasies: *Trilafon Repetabs* word veral aangedui wanneer 'n langdurige kalmeringseffek verlang word by die behandeling van besorgdheid, spanning en psigomotoriese oorbedrywigheid. Hul langdurige braakbestrydende effek is ook van besonder groot waarde by die behandeling van hyperemesis gravidarum en die eenvoudige mislikheid en braking wat op swangerskap volg, asook die mislikheid en braking wat die gevolg is van maagdermontsteking, na-operasie-toestande, karsinomatose, artsenymiddel- of bestralingsterapie, en psigogeniese faktore.

Dosis: Soos in die geval van alle kragtige geneesmiddels is die beste dosis die kleinste dosis wat die verlangde kliniese effek uitoefen, en iedere pasiënt moet individueel behandel word.

Eenvoudige Besorgdheid en Spanningstoestande: Een *Trilafon Repetab* een of twee maal per dag is in die reël voldoende. 'n Totale daaglikse dosis van meer as twee *Trilafon Repetabs* is selde nodig om 'n gunstige reaksie teweeg te bring.

Matig Versteurde Buitepasiënte. Een of twee *Repetabs* soggens en saans verskaf die gebruiklike totale dosis van 8 tot 32 mg. aan ambulatoriese psigiatriese buitepasiënte.

Psigiatriese Pasiënte in Hospitale: Twee tot vier *Repetabs* soggens en saans—na gelang van die erns van die simptome en individuele reaksie—is die gewone dosis. 'n Totale daaglikse dosis van 64 mg. moet nie oorskry word nie.

Mislikheid en Braking: In akute gevalle kan twee *Repetabs* aanvanklik toegedien word. Die gemiddelde dosis is een *Repetab* soggens en saans.

Dosis vir Kinders: Een *Trilafon Repetab* kan soggens en saans aan kinders bo twaalf jaar gegee word om 'n kalmerings- en braakbestrydingseffek uit te oefen.

Voorsorgsmaatreëls en Kontra-indikasies: Gereelde toesig moet gehou word oor pasiënte wat *Trilafon* ontvang. Agranulositose is nie gerapporteer volgende op die die gebruik van *Trilafon* nie, maar die moontlikheid van beenmurgdeprimering soos waargeneem nadat ander fenotiasienmiddels gebruik is, kan nie heeltemal uitgesluit word nie. Leukopenie of ander bewyse van beenmurgdeprimering is kontra-indikasies vir die gebruik van die middel. Die braakbestrydende effek van *Trilafon* kan tekens van toksisiteit wat deur té groot dosisse ander middels veroorsaak is, versluier, of die diagnose van kwale soos breingewasse of ingewandsobstruksie bemoeilik.

Daar is ook kontra-indikasies vir die gebruik van *Trilafon* in neerslagtige toestande, of die neerslagtigheid nou al van psigiese oorsprong is, dan wel of dit die gevolg is van die gebruik van middels wat die sentrale senuweestelsel deprimeer, bv. barbiturate, alkohol, en verdowings- en dergelike middels. 'n Betekenisvolle styging van die liggaamstemperatuur wat nie aan iets anders toegeskryf kan

word nie, kan bes moontlik 'n aanduiding van individuele onverdraagsaamheid vir die middel wees, in watter geval behandeling met *Trilafon* gestaak moet word.

Net soos met ander fenotiasienmiddels moet *Trilafon* met groot versigtigheid voorgeskryf word vir pasiënte met 'n voorgeskiedenis van stuiptrekkingskwale; pasiënte wat 'n ernstige reaksie op ander fenotiasienmiddels getoon het, moet onder gedurige toesig gehou word.

Ekstrapiramidale simptome wat die geneesheer sterk aan die Parkinson-sindroom herinner, is soms waargeneem, maar hierdie verskynsels het binne 48 uur verdwyn volgende op 'n vermindering van die dosis, die onttrekking van die middel, of, indien nodig, die toediening van anti-Parkinson-middels.

Nadere inligting en monsters is verkrygbaar van Scherag (Pty.) Ltd., Posbus 7539, Johannesburg.

ZACTIRIN

'N NIE-NARKOTIESE PYNSTILLENDE MIDDEL WAT SO DOELTREFFEND SOOS KODEÏEN IS

Die Produk: *Zactirin* is 'n kragtige, nie-narkotiese pynstillende middel bevattende die nuwe skeikundige verbinding, etoheptasien. Dit het die bewys gelewer dat dit net so doeltreffend soos kodeïen is vir die verligting van middelmatig ernstige pyn (d.w.s. pyn wat te kwaai is om deur asperien of AFK-verbindings verlig te word, maar darem nie so ernstig is dat dit die gebruik van morfienagtige middels regverdig nie). *Zactirin* het geeneen van die onwenslike newe-effekte van kodeïen nie (hardlywigheid, duiseligheid, mislikheid, ens.), en dit skep *geen verslaafheid* daaraan nie.

Gebruik van die Produk: Daar is bevind dat *Zactirin* veral doeltreffend is vir die verligting van pyn laag in die rug af, pyn wat die gevolg van kleiner traumatiese beserings is, gewrigspyn en verwante kwale (gewrigsontsteking, slymbeursontsteking, sinkings, sinovitis, ens.), buik-, perineum- en maandstondpyn, en die pyn wat op 'n operasie of op tandheelkundige behandeling volg.

Formule: Iedere onderskeidende geel en groen *Zactirin*-tablet bevat 75 mg. etoheptasiensitraat (die geel laag) en 5 gr. asetielsalisielsuur (die groen laag).

Dosis: Vir middelmatige tot middelmatig ernstige pyn, is die aanbevole dosis 2 *Zactirin*-tablette, 3 tot 4 maal per dag.

Vir ligte pyn, sal 1 *Zactirin*-tablet, 3 tot 4 maal per dag, waarskynlik voldoende wees.

Die totale daaglikse dosis moet nie meer as 8 tablette wees nie.

Beskikbaarstelling: Tablette, bottels van 24.

Fabrikante: Wyeth Laboratories (Pty.) Ltd., Posbus 8138, Johannesburg.

MAREVAN

'N MONDELINGE STOLLINGSTEENMIDDEL

Evans Medical Supplies kondig die beskikbaarstelling van *Marevan* aan, en verstrek die volgende inligting.

Marevan (warfariennatrium, Evans) is 'n mondelinge stollingsteenmiddel. 'n Kliniese proefneming met 'n reeks van 175 pasiënte het aangetoon dat *Marevan* besonder maklik gekontroleer kan word, aangesien daar baie min wisseling in individuele dosisvoorskrifte is. Die aanvanklike dosis was 35–40 mg. vir pasiënte wat ernstig siek was, en pasiënte bo die ouderdom van 75 jaar; 40–50 is gegee aan sterker pasiënte onder 75 jaar. 'n Terapeutiese protrombienpeil is binne 36 uur bereik. Die eerste instandhoudingsdosis is op die derde dag toegedien. Die daaglikse dosis wat nodig was om die protrombientyd op 2½ keer die normale tyd te hou, het gewissel van 2–15 mg. Die gemiddelde hoeveelheid was 9 mg.

Die daaglikse wisselings van die dosis wat nodig is, is klein. So min soos 0.5 mg. kan gewoonlik 'n verandering in die protrombientyd teweegbring. Omdat die effek van sodanige variasies eers na ongeveer 36 uur sigbaar word, is dit raadsaam om die dosis in terme van 'n 3-daagse siklus te betrag sodat die protrombientyd standhoudend op die optimum-peil gehou kan word. Die sterktes van *Marevan* is op so 'n manier ontwerp dat die totale dosis vir so 'n 3-daagse tydperk met minimale daaglikse verandering toegedien kan word. Die minimumvariasie in die 3-daagse dosis word dus verskaf deur die byvoeging of weerhouding van die helfte van 'n tablet van 3 mg. gedurende dié tydperk. Aan die ander kant, as albei tablette gebruik word, is dit moontlik om enige gespesifiseerde dosis presies tot 0.5 mg. toe te dien.

Marevan is verkrygbaar in tablette van 3 mg. (met 'n blou kleur) en 5 mg. (met 'n rooi kleur), in houers van 100 tablette. Die tablet van 5 mg. is hoofsaaklik vir die aanvanklike dosis bedoel. Met die mate van beheer wat met die tablet van 3 mg. bewerkstellig kan word, behoort dit selde nodig te wees om die 5-mg.-tablet vir instandhoudingsterapie te gebruik.

Verspreiders: Evans Medical Supplies, Posbus 6607, Johannesburg.

VERWYSING

Toohey, M. (1958): Brit. Med. J., **2**, 892.